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STOCKAGE OBJECTIVES FOR SLOW MOVING REPAIR PARTS

PHILIP G. GRAESSLE

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STOCKAGE OBJECTIVES

FOR

SLOW MOVING REPAIR PARTS

* * * * *

Philip G. Graessle

STOCKAGE OBJECTIVES

FOR

SLOW MOVING REPAIR PARTS

by

Philip G. Graessle

Lieutenant Commander, Supply Corps, United States Navy

Submitted in partial fulfillment of
the requirements for the degree of

MASTER OF SCIENCE
IN
OPERATIONS RESEARCH

United States Naval Postgraduate School
Monterey, California

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ABSTRACT

Relatively little work has been performed in the past on inventory control models for low demand repair parts. A simple inventory control system for determining optimal stockage objectives for such items is discussed and evaluated over a wide range of parameters. Stockage objectives are obtained by minimizing the total variable cost which is considered to be the sum of the carrying and outage costs. A one and two depot supply system is studied for items whose stochastic demand characteristics have stationary Poisson probability distributions. Computer programs are presented for evaluating the models along with the resulting graphs and tables.

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TABLE OF SYMBOLS (AND ABBREVIATIONS)

Symbol	Meaning	Introduced On Page
A	The ratio of PLT to t, a constant of proportionality	16
C_1	Carrying cost	8
C_2	System outage cost	9
C_4	Depot outage cost	16
K(S,u)	Total variable cost of basic model	12
$K_2(S,u)$	Total variable cost of alternative model	16
PLT	Procurement lead time	5
p(S,u)	Probability distribution function	12
S	System stockage objective	11
S_1	Depot stockage objective	16
T	PLT	12
t	Redistribution time	16
u	Mean system demand during PLT	12
u_1	Mean depot demand during redistribution time period	16
v	Transportation cost of a redistribution	16
Z	Stock level or stock on hand	10
λ	Mean system demand rate	12
λ_1	Mean depot demand rate	16

1. Introduction

Inventory control models for items with extremely low demand have received relatively little attention in the past. In fact, it was not until after World War II, when operations research emerged in force, that significant detailed attention was focused to any extent on any phase of the stochastic nature of inventory problems. During previous times, inventory systems had been treated as if they were deterministic, except for a few isolated cases, such as some of Wilson's work where an attempt was made to include probabilistic considerations [5]. About 1947 a stochastic version of the simple lot size model was developed by Whitin [14] whose book, published in 1953, was the first book in English which dealt in any detail with stochastic inventory models. Although operations research methods have been increasingly applied to inventory control problems, the emphasis has been primarily on fast moving units with the resulting literature being concentrated in this area.

For military supply systems it is recognized that a large proportion of the total number of items carried in stock, particularly in the technical repair parts inventory, fall into the slow moving category. More and more new and sophisticated equipments are being used by the Navy. This causes the introduction of a large number of repair parts into the supply system. Many of these repair parts, such as common resistors and capacitors, are frequently used and consequently create a rapid turnover of stock. However, the majority of repair parts experience very little movement. As an example, over half of the electronic repair parts maintained in inventory have no demands during a three month

period. The basic reason that so many slow moving items are stocked is that insurance is needed since there are often no immediately available commercial sources for these items and therefore equipments, and possibly ships and planes, could be down for extended periods while a long lead time item was being produced. With the increasing trend in the introduction of exotic equipments, it can be expected that even more items will become peculiar to military use. Therefore, it can be anticipated that a large percentage of the items maintained in the military inventory will continue to be stocked for insurance purposes and be of the slow moving variety. The problem of designing a workable and acceptable control system for low demand repair parts is therefore very important. This paper is presented as an aid in helping to solve this problem.

The basic purpose in constructing a mathematical model of an inventory control system is to use it as an aid in developing a suitable operating policy. Many models have no immediate application because of the restrictiveness of the assumptions or because of their abstractness. They are developed, however, because they exhibit some theoretical properties which are important in understanding the nature of inventory systems. Nevertheless, solutions which are not effectively computable are not properly solutions at all. Existence theorems are necessary in the development of the state of the art, but should not be confused with algorithms which provide optimal solutions. Even iterative methods which lead in principle to a solution cannot be regarded as acceptable if they involve computations beyond the scope of present day computers [1]. Although much effort has

been applied to theoretical work lately, a considerable amount of work has also been accomplished which is concerned strictly with practical applications. The military has sponsored many of the studies that have proceeded along both practical and theoretical lines.

In most models an attempt is made to develop procedures that will minimize overall cost. The model presented in this paper is no exception. Since the military system is so complex, it would be extremely impractical to attempt to establish a model which would be expected to function properly for all items under the control of the various inventory managers. If such a model were produced it would be so complicated that it would be extremely difficult, if not impossible, to solve any problem analytically. Consequently, it seems logical and imperative that models be derived with reference to some subset of the entire military inventory. The model for slow moving items presented in this paper, with the resulting graphs and tables intended to assist in the application of the model, meets the above inventory segmentation restriction as well as being of a practical nature. Although the total military inventory system is multiechelon in nature, only the wholesale portion, or that part which is directly controlled by an inventory control point will be considered.

2. Basic Model

Because cost reduction or cost minimization is a primary objective in the management of the Navy's Supply System, the basic problem is to establish optimal stockage objectives for the many items carried in inventory; that is, objectives which minimize the attendant costs. The total cost minimization concept is simply stating the supply performance goal as the minimization of the sum of the variable costs. Variable costs are segregated from fixed costs since a change in operating policy does not cause a change in fixed costs. The following model is concerned with establishing an inventory control policy for items with extremely low demands.

Due to the slow moving nature of the items being considered, certain basic assumptions can be reasonably made. When the expected savings in ordering costs that would result from buying in lots is less than the concomitant increases in carrying charges, there is no justification for using a lot size formula. When this is the case, it is appropriate to buy a new item as units are demanded and the model presented will assume items are ordered one at a time.

When the demand pattern is described probabilistically, then it will be said that a stochastic process generates the demand pattern. In the real world, the stochastic process associated with the demand pattern will always be changing with time; however, in some cases these changes are so slow that they may be ignored, and the mathematical model, it may be assumed, has no such changes. The assumption is made here that the items have a stationary Poisson probability distribution for demand.

If the demand pattern is of a stochastic nature, it is

seldom economically feasible for a system to carry enough stock so that there will always be material on hand when a requisition is received. A most important characteristic of the control process is what happens when a demand occurs when the system is out of stock. Classically, two possibilities arise. Either the demand is lost, or a backorder is established and the customer waits until the inventory system obtains sufficient stock to meet the demand. Because of the captive nature of the military supply system's customers and the belief that if a repair part is ordered it is needed, only the backorder possibility will be considered.

Procurement lead time (PLT) is defined as the interval between the time when the inventory control point decides that an order for a replenishment should be made and the time that material arrives at a stock point and is received and available for issue to a customer. Seldom will the PLT be constant, since the shipping time, the time to fill the order, and the time required to process the necessary paper work and take the material up in stock can vary from one order to another. Of course, it is seldom possible to predict a priori precisely as to what the lead time will be. It is assumed, however, that the variations in lead time is small enough so that, in the model presented here, the PLT may be considered to be a constant for any given item of supply. It will be pointed out that this assumption is inconsequential if there is independence between the lead time periods.

When speaking about cost minimization, it is necessary to be specific in regard to what costs are being considered. The costs incurred in operating an inventory system play a major role in

determining what the operating policy should be. The various cost components to be included, as well as the time periods over which they are computed and the method of handling the stochastic elements of the problem, must be indicated. Since some costs are always fixed despite the policies being followed, they need not be included in a minimization problem as they would have no relative effect on the outcome. An attempt will be made, however, to identify the fixed costs as well as the variable costs which influence inventory policy. Fundamentally, there are five types of costs which may play an important role in developing operating policies. These are:

1) Carrying cost
2) Outage cost
3) Procurement cost
4) Issuing cost
5) System operating cost

In the following paragraphs these costs will be discussed in some detail; it will be apparent that these costs will vary from item to item and from time to time.

Carrying cost. A most important consideration is the cost of carrying an item in the supply system or the cost of maintaining inventories on hand. This cost is often referred to as the holding or storage cost. Included in this cost is the real out-of-pocket costs such as breakage, pilferage, loss of material at the storage site, and costs of maintaining and operating the warehouses and bookkeeping costs. Basically, these are the costs of overhead at a supply depot. Another important cost, which is not a direct out-of-pocket cost, but rather an opportunity cost, is incurred by

having capital tied up in the inventory of a certain item rather than having it invested elsewhere. This opportunity cost is ordinarily considered a function of the discount rate. Although discount costs may be more important to a commercial concern, they cannot be ignored in government work, as funds are limited and interest is continuously being paid on money borrowed by the government. In the Department of Defense the discount rate is often considered to be in the neighborhood of 5 percent, although some economists feel that this is understating the rate several fold.[1] The cost caused by having funds invested in inventory is properly a part of the carrying cost. There is one other cost not mentioned above, for which an attempt is often made to include as a part of the carrying charge. This is the obsolescence cost, often referred to as the salvage cost. The salvage cost of a no longer need item is the original cost plus the discount rate multiplied by the amount of time the material was held in inventory minus its disposal value. Salvage costs are always incurred at a fixed point in time, but the obsolescence date can rarely be predicted with a degree of certainty in advance. A method to aid in minimizing this cost will be discussed later in this paper. Not all of the individual costs which contribute to the overall carrying cost vary in the same manner. In fact, it is very difficult to represent accurately all the costs involved. Therefore, it is usually necessary to introduce some simplifying approximation. As is frequently done in the literature, it will be assumed that

[1]Planning Research Corp. R-156 "The Interest Cost of Holding Military Inventories." This report indicates that a more realistic figure would be in the neighborhood of 20%.

the instantaneous rate at which carrying costs are incurred is proportional to the dollar investment in inventory at that point in time or the carrying cost (C_1) equals IC

where I = Constant of proportionality

C = Unit cost

Outage Cost. The outage cost, often referred to as the stockout or penalty cost, also plays an important role in the model. The outage cost is the cost which results when a requisition is submitted, and there is no stock on hand (i.e., when demand exceeds supply). In the model only system stock outage is considered (a tacit assumption that redistributions are free and instantaneous). In a later section of this paper, redistribution costs and depot outage costs will be included and analyzed. Although stock outages can create either backorders or lost sales, only the back order case will be considered since the probability of a loss sale in a military supply system is extremely slight. Additionally, such factors as loss of customers' goodwill need not be considered for self-evident reasons. The primary factor, therefore, is the cost of having some equipment inoperative, or operating at less than full efficiency, because of the lack of a repair part. The administrative cost caused by backorders can usually be considered to be insignificant compared to the cost of having an equipment down and consequently will just be considered to be an intregal part of the overall outage cost. Outage costs are difficult to quantify since all items, particularly critical items, must be examined in some detail. The cost of not having a knob for an electronics equipment would normally be zero since this convenience part could be lost and

the equipment could still be operated to full efficiency. At the other extreme, a repair part for a fire control radar on a Guided Missile Cruiser could be needed which would cause the entire fire control system to be down, with the result that the ship in question might become a liability rather than an asset. The outage cost per unit of time in this latter example could be evaluated as many thousands of dollars. Unfortunately, this example is not too unrealistic since the redundancies found in weapon systems aboard World War II type ships are often not provided in the more recent, sophisticated and expensive ships. Consequently, it is unrealistic to manage our present supply system disregarding an outage cost. Fortunately, however, this cost is not too sensitive as will be shown in the evaluation of the basic model over a wide range of parameters. As in the case of the carrying cost, the outage cost, denoted C_2 in the model, will be assumed to be a linear function of time. This seems to be a reasonable approximation of the real world situation.

Procurement cost. Procurement costs can be divided into two parts. First, there is the amount paid to buy an item which represents the cost of the unit purchased. Second, there are the costs incurred by the inventory system itself in making a procurement which are basically the costs of processing an order through an inventory control point. These costs include such things as paper and postage costs, costs of telephone calls and telegraph messages, cost of computer time needed to make any necessary computations or to update records. They often include the costs of transporting the item from the source to the applicable supply depots and the receiving costs incurred at the supply

depots. The costs incurred by the supply system itself in placing an order of a given amount Z of an item is a function of the amount ordered and can be represented by C(Z). Various assumptions about this cost function C(Z) appear reasonable in different circumstances. The simplest is that a linear function exists or that the cost of ordering is directly proportional to the amount ordered. In the literature a concave or convex function is often hypothesized, but in the simple model presented here a fixed cost will be assumed, since items are always ordered one at a time.

Issuing costs. The process of making an issue creates costs throughout the cycle of the issue procedure. The normal issuing costs include those caused by various accounting operations, stock record updating, invoice preparation, material picking and issuing, and packing and shipping procedures. The important thing to note about all of these costs is that, while they vary with demand rates, as long as stock is on hand they generally will not depend on the operating policies used to control the supply system. Therefore, they do not need to be considered when studying costs that vary as operating policies are changed. However, the costs arising when a requisition is received when there is no stock available will depend on the operating policy, as the fraction of the time that an outage occurs is dependent on this policy. For convenience, this later cost will be included in the stockout costs which were discussed previously. Using this technique, it will be unnecessary to further consider issuing costs per se.

System operating costs. In order to apply any given

operating policies, an inventory system must gather data necessary for its use. The cost of collecting this information is dependent on the type of system used. Such costs as having a computer continuously update the inventory records, the cost of making an actual inventory count, and the cost of making demand predictions should be included. Since transaction reporting systems, and uniform data processing equipments and programs, are or will be used in the near future throughout a major segment of the supply system, system operating costs will be considered to be fixed costs.

For deterministic models, it has been shown that it is never optimal to have any stock on hand when an order arrives [5]. However, it is normally true that the optimal safety level should be positive. The reason for this, of course, is to limit the occurrence of outage costs which could be caused by the random nature of lead time demands.

There remains the question of how the stochastic demand element in the problem is to be handled. It will be necessary to introduce probabilities and compute expected values in order to determine the average cost per time period. Since an order is placed each time there is a demand; the stockage objective must remain constant. The stockage objective equals on hand units plus on order minus backorders. Denoting the stockage objective by S, the problem is to determine the optimal value of S which will minimize variable costs. In the case in question, the optimal S is found by balancing carrying costs against penalty costs, since all other costs have been assumed fixed. For the model to be meaningful, demands will be considered to be of a discrete nature

and S to be an integer. It is also assumed that within a leadtime all S units over and above the backorders will become available to meet demands; this means that there is no special reservation system, or that issues will always be made if stock is on hand regardless of the priority of the demand.

Let K(S,u) be the total expected variable cost for the mean procurement lead time (PLT) involved and let Z be equal to the stock on hand at any instant of time. Z represents a bookkeeping stock and therefore can assume negative values. The notation p(x) will represent the probability that there will be x units demanded during the PLT. Since a Poisson distribution is being used,

$$p(x) = \frac{(\lambda T)^x e^{-\lambda T}}{x!}$$

where λ = mean demand rate

T = PLT

For notational simplification, let $u = \lambda T$ or u will equal the Poisson parameter for the PLT period. The probability that Z units are on hand in the system at any instant of time is therefore simply p(S - x). The expected on hand inventory at any instant of time is then,

$$\sum_{x=o}^{S} (S - x)\, p(x)$$

Similarly, the expected number of backorders is

$$\sum_{x=S+1}^{\infty} (x - S)\, p(x)$$

Multiplying by the carrying and outage costs gives the expected

total variable cost (K(S,u)) per PLT

$$(1)\quad K(S,u) = C_1 \sum_{x=o}^{S} (S - x)p(x) + C_2 \sum_{x=S+1}^{\infty} (x - S)p(x)$$

The optimal S which minimizes K(S,u) occurs when,

$$(2)\quad \sum_{x=S}^{\infty} p(x) > \frac{C_1}{C_1 + C_2} > \sum_{x=S+1}^{\infty} p(x)$$

The complete derivations of equations (1) and (2) are developed in Appendix A.

It has been shown by Hadley and Whitin [5] that the same results are obtained when the lead times are considered to be random variables that are exponentially distributed provided the various lead times are independent. The same optimal stockage objective is obtained in either case as long as material is ordered as soon as a demand is received. A more surprising result which is also pointed out [5] is that the optimal stockage objective is independent of the nature of the lead time distribution, providing the lead times are independent.

3. Alternative Model

It is felt that the basic model is sound and the assumptions reasonable with the exception of the assumption that there is only one stocking point in the supply system, or alternatively, that redistributions are free and take place instantaneously. The case where redistributions are neighter free nor instantaneous will now be examined. It is known, of course, that a cost does occur when material is moved from one stock point to another and that, even while utilizing premium transportation, a significant amount of time is required to move material across country. The question to be examined, therefore, is whether costs resulting from redistributions warrant consideration and continual evaluation.

In order to make such an analysis, it will be necessary to make some simplifying assumptions so that analytical solutions can be derived. The first of these assumptions is that the distribution system for slow moving repair parts in the Naval Supply System is a relatively simple one. To decrease overhead or carrying costs, low demand items are normally stored at only two activities in the wholesale supply system (i.e., Naval Supply Centers at Oakland and Norfolk[1]). Consequently, in this analysis only a two stock point system will be considered.

Additionally, it will be assumed that the demands at these two activities are independent. If independence is not hypothesized, the analysis becomes extremely complex and no attempt is

[1]Interviews with Bureau of Supplies and Accounts personnel revealed that this policy will be extended under the Uniform Data Processing System presently being instrumented.

made here to account for dependent situations.

The system being considered, therefore, will be a two depot system with a central inventory control point which receives the necessary control data through a direct transaction reporting network. Stockage objectives in the Naval Supply System are computed based on the total system demand, not on the sum of depot stockage objectives derived from individual depot demand patterns. The model formulation follows this basic policy.

Actual redistributions per se will not be considered in this model, but rather transcontinental shipments are provided when one of the depots cannot satisfy a request from its warehouse while the other depot has stock on hand. That is, redistributions are made only when depot stock levels reach zero and there is a backorder and the request can be satisfied by supplying material from the other coast. This is normally the procedure that is followed in practice since stock levels are small due to the low demand items under consideration. This procedure does not necessarily imply that the optimal policy would never indicate the need for a redistribution until there is a backorder; it only implies that the probability of this event is small enough so that it does not have an appreciable influence on the system stock position.

The total variable costs in the expanded model can be considered to be equal to the system carrying cost plus the system outage cost plus the two depot outage costs, or:

$$(3)\quad K_2(S,u) = C_1 \sum_{x=o}^{S} (S-x)p(x,u) + C_2 \sum_{x=S+1}^{\infty} (x-S)p(x,u)$$

$$+ C_4' \sum_{x=S_1+1}^{\infty} (x-S_1)p(x,u_1) + C_4' \sum_{x=S_2+1}^{\infty} (x-S_2)p(x,u_2)$$

where the first two terms on the right of the equality are the same as in the basic model and the last two terms are the individual depot outage costs. Obviously, $S_1 + S_2 = S$ where S equals the system's stockage objective. To simplify the problem, S_1 will be allowed to equal S/2 or S/2 - 1/2 depending on whether S is an even or odd integer respectively. Thus, it is assumed that the demands at the two stock points are approximately equal. The following notation applies:

$2\lambda_1 = \lambda$ = Mean system demand rate

u = Mean system demand per PLT

$u_1 = \lambda_1 t = \lambda t/2$ = Mean depot demand during redistribution time period

where t = redistribution time

Since both average redistribution times (t) and procurement lead time (PLT) are considered to be constant, t = T/A where A is a constant or proportionality, and $u_1 = u/2A$.

The depot outage cost per lead time equals the system outage cost (C_2) plus the cost of transportation (v) or

$C_4' = v + C_2$

The last two terms of equation (3) can be combined and allowing $C_4 = 2C_4'$, equation (3) can be rewritten as

$$(4)\quad K_2(S,u) = C_1 \sum_{x=o}^{S} (S-x)p(x,u) + C_2 \sum_{x=S+1}^{\infty} (x-S)p(x,u)$$

$$+ C_4 \sum_{x=S_1+1}^{\infty} (x-S_1)p(x,u/2A)$$

As is shown in Appendix B, the optimal stockage objective (S) which minimizes $K_2(S,u)$ is one for which S satisfies the following inequalities:

$$(5)\quad \sum_{x=S+1}^{\infty} p(x,u) + \frac{C_4}{C_1+C_2} \sum_{x=S_1+1}^{\infty} p(x,u') \leq \frac{C_1}{C_1+C_2}$$

$$\leq \sum_{x=S}^{\infty} p(x,u) + \frac{C_4}{C_1+C_2} \sum_{x=S_1}^{\infty} p(x,u')$$

where $u' = u/2A$

By evaluating a large range of parameters, it has been shown that the depot outage cost influences optimal stockage objectives to a very slight degree and may therefore be disregarded. This will be discussed in greater detail in the following section.

4. Discussion and Results

A mathematical model would only be of academic value if the assumptions made while constructing the model were unrealistic. An attempt will be made in the next few paragraphs to look at the assumptions involved more closely to attempt to show that the model approximates the real world situation to a large degree.

The basic possible defect in the model is felt to be the one stocking point distribution system. Looking closely at the alternative model, which was discussed in the previous section, it has been determined that the addition of the depot outage cost factors have a very slight influence on the determination of an optimal stockage objective. With the aid of a CDC 1604 computer and a Fortran computer program, which is presented as Appendix D, the stockage objectives were evaluated at 19,200 different combinations of parameters. Iterations were made over a wide range of the four variable parameters involved. The below chart lists the parameters, number of different values assigned to the parameters, and the range of the values assigned:

Parameters	Number of values assigned	Range
Carrying cost per quarter	8	$2 - $100
Outage cost per quarter	8	$20 - $25,000
Mean system demand per P.L.T.	50	.1 - 5.0
Ratio of P.L.T. to redistribution time	6	7.5 - 45

Of the 19,200 evaluations made, only on 533 occasions (2.8% of the time) did a stockage objective differ from the objectivies derived by the basic model. In each of these cases the new stockage objective was one greater than that determined by the basic model. As would be expected, the number of deviations decreased rapidly as

the ratio of PLT to redistribution time increased. When using the 7.5 ratio there were 238 (7.4%) differing stockage objectives; while using the 45 ratio, only 38 (1.2%) deviations were generated. For this reason, more values were not generated using even higher ratios of PLT to redistribution time, although the real world expectation would often be in the greater than 45 range. For example, the PLT for many procurements is longer than three months, while redistributions could be made in less than two days using aircargo as the mode of transportation. Twenty dollars was used as a fixed transportation cost in this evaluation but this value is of little importance in most instances since it is added to the outage cost which normally predominates. As a result of the analysis, it can logically be concluded that disregarding redistribution costs, which include the attendant depot outage costs, does not significantly change the model as long as the PLT to redistribution time ratio is greater than 7.5. As will be pointed out later, if the PLT approaches zero there is no incentive to stock material at all and the entire problem becomes trivial.

The assumption that all items involved would always be ordered as soon as an issue is made (i.e., ordered one at a time) is more difficult to explain. This assumption is critical to the analytical development and a much more complicated model, with the resulting evaluation difficulty, arises when the order quantity becomes greater than one. For extremely low demand values, one-at-a-time ordering seems intuitively appealing. The demand factor would therefore provide an upper bound regarding the application of the model.

The salvage or obsolescence problem provides the other major

drawback to the model. If no salvage cost factor is included in the carrying cost then it is tacitly assumed that all material will eventually be used. This, of course, is often not the case since new equipments usually replace existing equipments throughout the fleet in a relatively short time period which causes the repair parts stocked in support of such equipments to become obsolete through the loss of applications. In many instances, the demand pattern appears truncated because of this phase out policy rather than steadily approaching zero as a repair part ages in the system. A realistic approach to this problem would be to reevaluate the outage cost periodically with the possible expectation of reducing this cost as an item remains in the system. In many cases it might be found that as an item ages it becomes less critical to the system, since the equipment it is supporting has become less critical due to the introduction of newer equipments or because of other modifications. The inventory manager should control this problem area by including an obsolescence factor in the carrying cost and insuring the establishment of updated realistic penalty cost periodically.

The assumption of a constant procurement lead time is not a critical one since, as pointed out previously, the average PLT can be used no matter what the distribution functions, and the same results obtained. The model does point out that the argument that longer PLT's only cause an earlier investment in inventory, but no overall long run increased cost, to be fallacious except where demand patterns are deterministic. An increase in the PLT, when demands are of a stochastic nature, increases the probability of eventually disposing items to salvage. This area could be a

rewarding field for separate study. In a similar vein, the assumption of a Poisson demand pattern was used because it seems to be the most appropriate; however, conceptually, the distribution could be arbitrary.

A primary consideration, which is an integral part of the model, is the need to recognize the important function played by the cost of stock outages in the formulation of inventory control policy. Although outage costs are often vaguely or tacitly recognized, seldom has there been an attempt by Navy inventory control managers to thoroughly evaluate this cost. To make an extremely accurate evaluation is, at best, very difficult, if not impossible, but this is not a justification for completely avoiding the issue. Goodwill and customer satisfaction losses need not be considered because of the captive nature of the military supply system's customers which would be involved in a competitive civilian economic system; however, the intangible national security factor is introduced. The goals of the logistician must be framed in the environment of deterrence, the ability to win should war come, national security and the impact on the national economy [8]. Fortunately, as is shown in Table 1, the optimal policy does not tend to be very sensitive to outage costs, and hence an estimate that is of the proper order of magnitude will suffice. Since the outage cost is not sensitive, inventory managers should be more prone to make a judgement as to its value, whereas a manager would be very reluctant to do so if a poor guess could cause large disparities. At least some ranking system in this area is needed since funds are limited and a saving in a non-critical area can be applied to the purchase of more

critical repair parts, with the end result providing additional security.

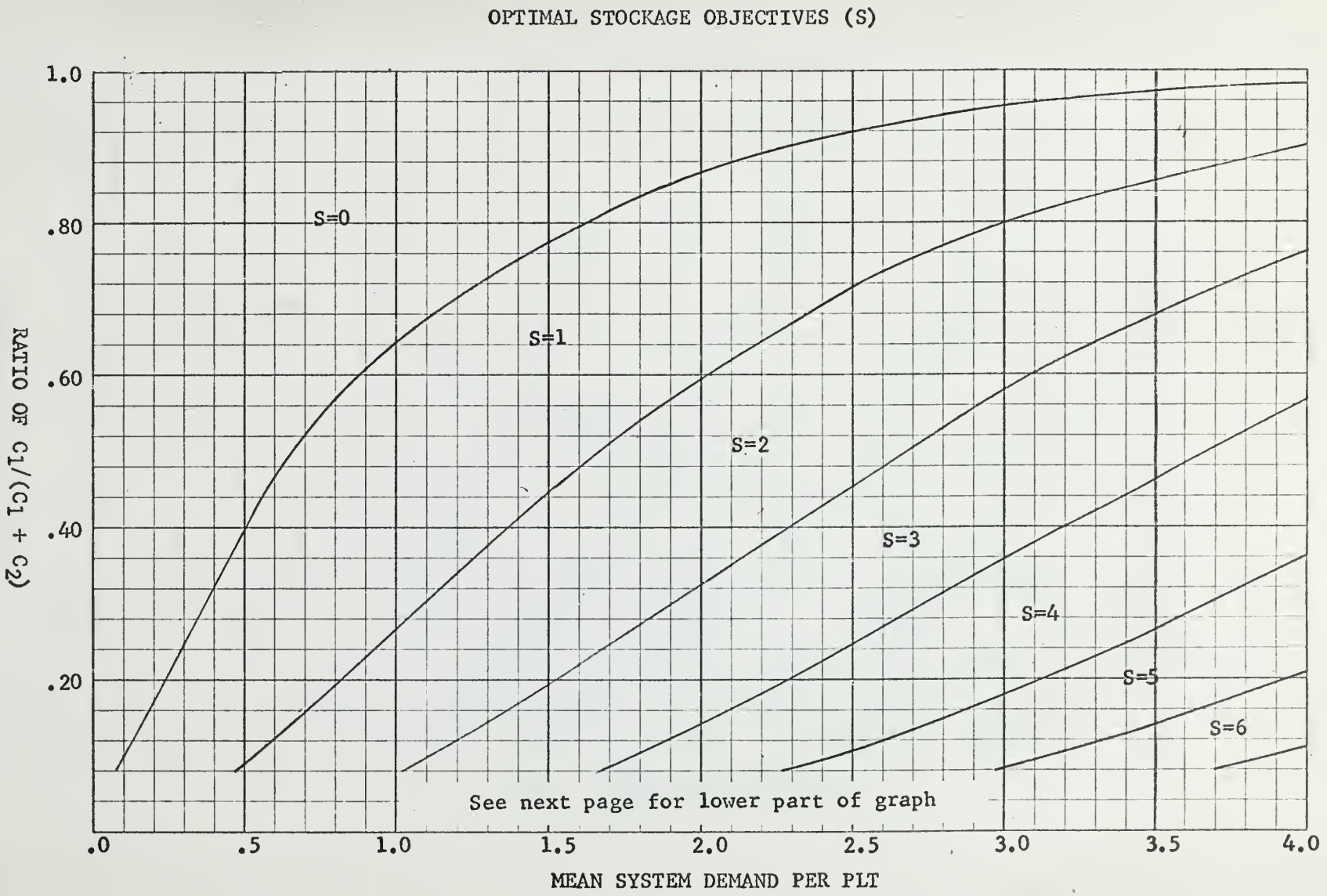
A simple cost analysis at an inventory control point should result in a reasonably accurate estimate of an item's carrying cost. An examination of Table 1 shows that extreme accuracy is not a necessity, although this cost is much more sensitive than the outage cost. When evaluating the carrying cost, it is necessary to approach the problem on an overall cost basis rather than attempt only to minimize costs in a parochial area while disregarding total system costs. Perhaps one of the basic deterrents of using variable cost minimization as an objective in a military supply system is the inflexibility of the budget structure. The cost minimization concept assumes that there is a trade-off between operating funds and funds for investment in inventory. Actually, the current budget process separates the formulation and review of the budgets for each of these fund segments which makes trade-offs more difficult to affect since managers tend to suboptimize in their field of concern while often disregarding the overall effect of such suboptimizations. If overall costs were considered, the model would offer a budgeting tool since total costs could be determined by adding the fixed costs to the variable costs involved. Carrying costs and outage costs vary from item to item and from time to time. In order to apply the model presented here it is, of course, necessary to evaluate those costs. The third value which is necessary to find is the average demand rate (u) per average PLT, which is

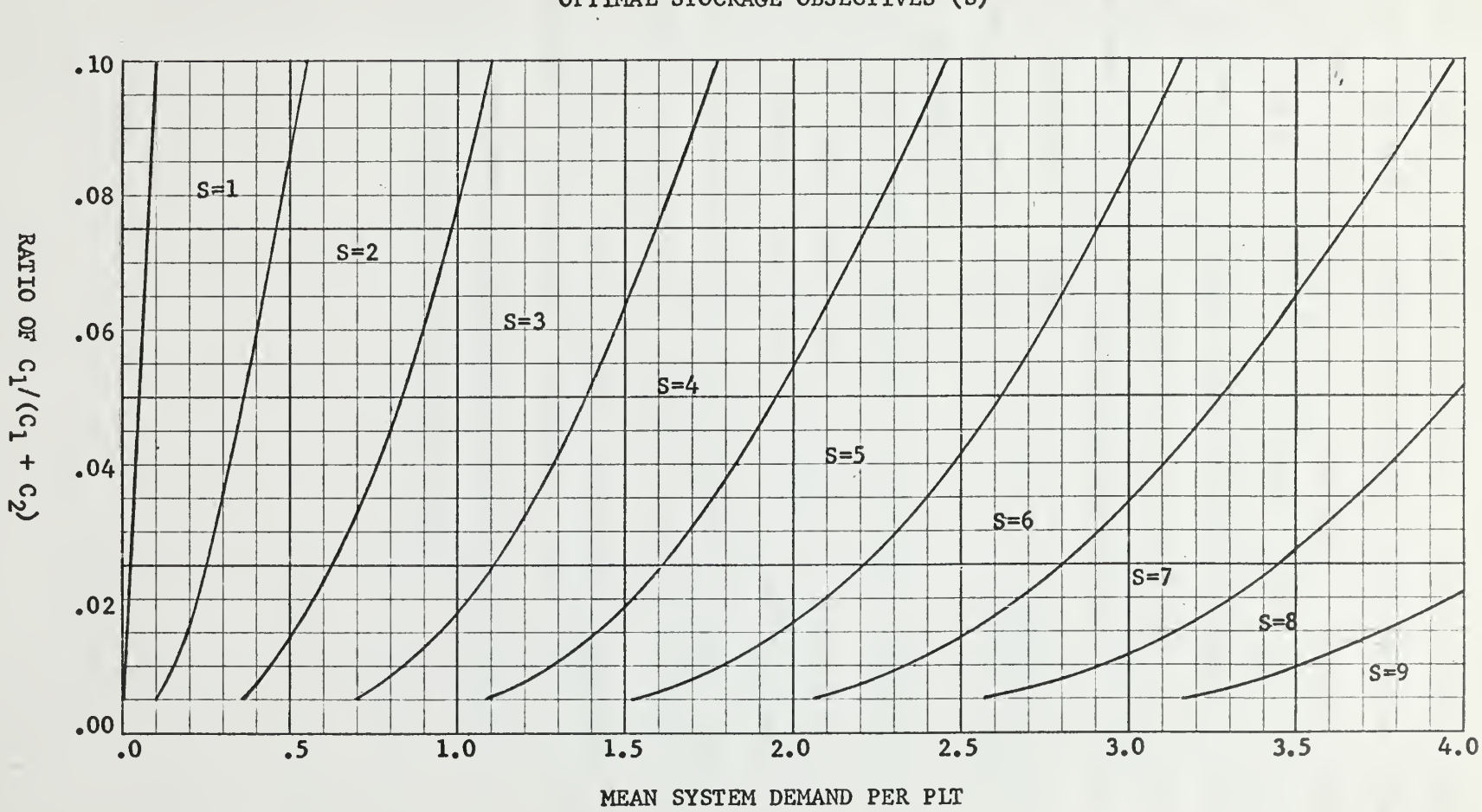
$$u = \lambda T/13$$

where λ = Average quarterly demand rate

T = PLT in weeks

This transformation has been chosen since data are normally maintained in the units cited. These three parameters can be entered in Table 1 and the appropriate system stockage objective determined or the ratio of carrying cost to carrying plus outage cost ($C_1 / C_1 + C_2$) can be calculated and the appropriate stockage objectives read from Figures 1 or 2 which are presented on the following pages.


OPTIMAL STOCKAGE OBJECTIVES (S)
1.0
.80
.60
.40
.20
RATIO OF $C_1/(C_1 + C_2)$
S=0
S=1
S=2
S=3
S=4
S=5
S=6
See next page for lower part of graph
.0
.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
MEAN SYSTEM DEMAND PER PLT


OPTIMAL STOCKAGE OBJECTIVES (S)
RATIO OF $C_1/(C_1 + C_2)$
.10
.08
.06
.04
.02
.00
S=1
S=2
S=3
S=4
S=5
S=6
S=7
S=8
S=9
.0
.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
MEAN SYSTEM DEMAND PER PLT

5. Conclusions

The model presented in this paper is simple enough so that it can easily be applied. More importantly, the assumptions appear to be reasonable approximations of real world situations as they exist in the present Naval Supply System, which tends to justify the consideration of possible application of the model. Additionally, the approach followed points out the need for further development of a means of determining outage or penalty costs. Until this facit of inventory control is fully appreciated and thoroughly attacked, inventory policies will be less effective than they might be.

As a final remark it is worth noting that, although the mathematical model observed was optimized with respect to cost, it does not necessarily follow that the real world system represented by the model will also be optimized. Since a number of simplifying assumptions were made in order to derive the model, what is expected is that the model will provide a reasonable operating policy if applied. In practice, there are so many variables and such a large number of complications that it is difficult to say what an optimal policy means.

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APPENDIX A

FORMULATION OF BASIC MODEL

Initially consider a single item at $t = 0$ with a stockage objective $S \geq 0$. Demands (x) are observed at times $t = 1,2,3,\ldots$. Let $x(t)$ be a random variable of demand at time t and assume the demand distribution to be Poisson with parameter u.

Therefore

$$x(t) = p(x,u) = \frac{e^{-u}u^{x}}{x!}$$

The ordering or purchasing policy is defined as order at time t the quantity equal to the demand at time t. This implies that $x(t)$ units are to be added to the stock on hand at time $(t + T)$, where T = procurement lead time.

If $t \leq T$, no ordered stock will have arrived by time t, since the first order was placed at time $t = 1$. Let $z(t)$ be the random variable representing stock on hand. Therefore

$$z(t) = S - \sum_{i=1}^{t} x_i \quad \text{if } t \leq T$$

If $t = n + T$, $(n \geq 0)$, then the stock ordered at $t = 1,\ldots,n$ will have entered the system. This implies that

$$z(t) = S - \sum_{i=1}^{n+T} x_i + \sum_{i=1}^{n} x_i = S - \sum_{i=n+1}^{n+T} x_i$$

i.e., the stockage objective S equals the sum of the stock on hand and on order.

Therefore for $t > T$

$z(t) = S - x$ where x is a random variable $x(n+1) + \ldots + x(n+T)$.

The development will now be confined to time $t \geq T$ since after time T the system may be considered to have achieved a stable state.

It should be noted that $z(t)$ is a bookkeeping stock and may take on a negative value. If $z(t)$ is less than zero, $z(t)$ units are needed at time t which are not available and an outage results. Conversely, if $z(t)$ is greater than zero a carrying cost is incurred. This leads to the creation and examination of two new random variables.

1) A random variable $y(t)$ of demand unable to be filled

$$y(t) = \begin{cases} 0 & \text{if } z(t) \geq 0 \\ -z(t) & \text{if } z(t) < 0 \end{cases}$$

2) A random variable $w(t)$ of stock on hand

$$w(t) = \begin{cases} z(t) & \text{if } z(t) > 0 \\ 0 & \text{if } z(t) \leq 0 \end{cases}$$

The following probability statements may then be written:

$$P\left[y(t) = o \right] = \sum_{x=o}^{S} p(x,u)$$

$$P\left[y(t) = x \right] = p(S + x,u) \quad x = 1,2,3,\ldots$$

$$P\left[w(t) = 0 \right] = \sum_{x=o}^{\infty} p(S + x,u)$$

$$P\left[w(t) = x\right] = \begin{cases} p(S - x,u) & \text{for } S \geq 1 \quad x=1,\ldots,S \\ 0 & \text{for } x > S \geq 0 \end{cases}$$

From these probabilistic equations the expected values of on hand and shortages are computed as follows:

$$E(y(t)) = \sum_{x=o}^{\infty} xp(S + x,u)$$

$$E(w(t)) = \sum_{x=o}^{S} xp(S - x,u)$$

The total expected cost K(S,u) is then equal to the carrying cost (C_1) times the expected stock on hand plus the outage cost (C_2) times the expected stock shortage or

$$K(S,u) = C_1 E(w(t)) + C_2 E(y(t))$$

$$= C_1 \sum_{x=o}^{S} xp(S - x,u) + C_2 \sum_{x=o}^{\infty} xp(S + x,u)$$

$$= C_1 \sum_{x=o}^{S} x \frac{e^{-u} u^{(S - x)}}{(S - x)!} + C_2 \sum_{x=o}^{\infty} x \frac{e^{-u} u^{(x + S)}}{(S + x)!}$$

Since

$$\sum_{x=o}^{S} x \frac{e^{-u} u^{(S - x)}}{(S - x)!} = \sum_{v=S}^{0} \frac{(S - v)\, e^{-u} u^{v}}{v!} =$$

$$\sum_{x=o}^{S} (S - x) \frac{e^{-u} u^{x}}{x!}$$

where $v = S - x$

and similarly

$$\sum_{x=o}^{\infty} x \frac{e^{-u}u^{(S+x)}}{(S+x)!} = \sum_{X=S+1}^{\infty} (x - S) \frac{e^{-u}u^{x}}{x!}$$

$$K(S,u) = C_1 \sum_{x=o}^{S} (S-x) \frac{e^{-u}u^{x}}{x!} + C_2 \sum_{x=S+1}^{\infty} (x-S) \frac{e^{-u}u^{x}}{x!}$$

The following additional transformation is performed in order that the accumulative Poisson distribution function tables [3] can be used when evaluating the equation.

$$(A1) \quad K(S,u) = C_1 S \sum_{x=o}^{S} p(x,u) - C_2 S \sum_{x=S+1}^{\infty} p(x,u)$$

$$- C_1 \sum_{x=o}^{S} xp(x,u) + C_2 \sum_{x=S+1}^{\infty} xp(x,u)$$

$$= S \left[C_1 (1 - \sum_{x=S+1}^{\infty} p(x,u)) - C_2 \sum_{x=S+1}^{\infty} p(x,u) \right]$$

$$+ C_2 \sum_{x=S+1}^{\infty} xp(x,u) - C_1 \left[u - \sum_{x=S+1}^{\infty} xp(x,u) \right]$$

and since

$$\sum_{x=S+1}^{\infty} xp(x,u) = u \sum_{x=S}^{\infty} p(x,u)$$

$$K(S,u) = S\left[C_1 - (C_1 + C_2) \sum_{x=S+1}^{\infty} p(x,u)\right] - u\left[C_1\right.$$

$$- (C_1 + C_2) \sum_{x=S}^{\infty} p(x,u)\Big]$$

By substituting in equation (A1) above

$$(A2)\quad K(S-1,u) = C_1(S-1)\sum_{x=o}^{S-1} p(x,u) - C_1 \sum_{x=o}^{S-1} xp(x,u)$$

$$-C_2(S-1)\sum_{x=S}^{\infty} p(x,u) + C_2 \sum_{x=S}^{\infty} xp(x,u)$$

By subtracting equation (A2) from (A1)

$$(A3)\quad K(S,u) - K(S-1,u) = C_1 - (C_1 + C_2)\sum_{x=S}^{\infty} p(x,u)$$

Since $\sum_{x=S}^{\infty} p(x,u)$ decreases as S increases,

$K(S,u) - K(S-1,u)$ increases as S increases. The object is now to find the S which minimizes the total variable cost $K(S,u)$.

(A4) $K(1,u) - K(0,u) \geq 0$ implies that the optimal S is zero.

(A5) $K(1,u) - K(0,u) = 0$ implies that the optimal S is 0 or 1.

If $K(1,u) - K(0,u) < 0$ there are two cases involved.

Case 1) There is an optimal S (denoted S') > 0

(A6) such that $K(S',u) - K(S'-1,u) = 0$ which implies that $K(S,u)$ is a minimum at S' and $S'-1$.

Case 2) There is an $S' > 0$ such that

(A7) $K(S',u) - K(S'-1,u) < 0 < K(S'+1,u) - K(S',u)$ which implies that $K(S,u)$ is a minimum at S'.

Substituting the right hand side of (A3) into (A7) gives

$$C_1 - (C_1 + C_2) \sum_{x=S'}^{\infty} p(x,u) \prec 0 \prec C_1 - (C_1 + C_2) \sum_{x=S'+1}^{\infty} p(x,u)$$

This implies that

$$C_1 \prec (C_1 + C_2) \sum_{x=S'}^{\infty} p(x,u)$$

and

$$C_1 \succ (C_1 + C_2) \sum_{x=S'+1}^{\infty} p(x,u)$$

or

$$\sum_{x=S'}^{\infty} p(x,u) \succ \frac{C_1}{C_1 + C_2} \succ \sum_{x=S'+1}^{\infty} p(x,u)$$

Substituting the right hand side of (A3) into (A4) gives

$$K(1,u) - K(0,u) = C_1 - (C_1 + C_2) \sum_{x=1}^{\infty} p(x,u) \succ 0$$

which implies that

$$\frac{C_1}{C_1 + C_2} \succ \sum_{x=1}^{\infty} p(x,u)$$

and

$$1 = \sum_{x=0}^{\infty} p(x,u) \succ \frac{C_1}{C_1 + C_2} \succ \sum_{x=1}^{\infty} p(x,u)$$

The above must hold since C_1 and C_2 are both assumed to be positive values. The above also implies that a minimum for $K(S,u)$ exists at a unique S if and only if there is an integer S' such that

$$\sum_{x=S'}^{\infty} p(x,u) \geq \frac{C_1}{C_1 + C_2} > \sum_{x=S'+1}^{\infty} p(x,u)$$

If $K(S',u) - K(S' - 1,u) = 0 = C_1 - (C_1 + C_2) \sum_{x=S'}^{\infty} p(x,u)$,

then

$$\frac{C_1}{C_1 + C_2} = \sum_{x=S'}^{\infty} p(x,u)$$ which implies S' and $S' - 1$ are

both optimal solutions.

APPENDIX B

FORMULATION OF ALTERNATIVE MODEL

The basic model is expanded to include two stock points and the resulting incorporation of redistribution costs between the two depots. The total variable cost, therefore, becomes the system carrying cost plus the system outage cost plus the depot outage cost. Where it is assumed that the demand rate at the two depots is approximately equal,

$2\lambda_1 = \lambda$ = mean system demand rate

where λ_1 = mean depot demand rate.

The total variable cost $K_2(S,u)$ equals

$$(B1)\quad K_2(S,u) = C_1 \sum_{x=o}^{S} (S-x)p(x,u) + C_2 \sum_{x=S+1}^{\infty} (x-S)p(x,u)$$

$$+ C_4 \sum_{x=S_1+1}^{\infty} (x-S_1)p(x,u_1)$$

Letting S_1 equal the stockage objective at one depot $S_1 = S/2$ or $S/2 - 1/2$ depending on whether S is an even or odd integer. Also

$u = \lambda T$ = mean system demand during PLT where T = PLT.

The depot demand rate u_1 is

$u_1 = \lambda_1 t = \lambda t/2$ = mean depot demand during the redistribution time period where t = redistribution time.

Both t and T are assumed to be constant, therefore

$A' = \frac{T}{t}$ where A' is a constant of proportionality.

This implies that

$$u_1 = \frac{\lambda T}{2A'} = \frac{u}{A}$$

The depot outage cost is considered to be equal to the system outage cost plus a transportation cost, or

$C_4' = v + C_2$ where v = the transportation cost

$C_4 = 2(v + C_2)$ since the factor of 2 is caused by a 2 depot system.

Equation (B1) can now be rewritten as

$$(B2)\quad K_2(S,u) = C_1 \sum_{x=o}^{S} (S-x)p(x,u) + C_2 \sum_{X=S+1}^{\infty} (x-S)p(x,u)$$

$$+ C_4 \sum_{x=S_1+1}^{\infty} (x-S_1)p(x,\tfrac{u}{A})$$

Letting the first two terms on the right hand side of the equality equal K(S,u) (from Basic Model), and $\frac{u}{A} = u'$ (B2) becomes

$$(B3)\quad K_2(S,u) = K(S,u) + C_4 \sum_{x=S_1+1}^{\infty} (x-S_1)p(x,u')$$

$$= K(S,u) + C_4 \sum_{x=S_1+1}^{\infty} xp(x,u') - C_4 S_1 \sum_{x=S_1+1}^{\infty} p(x,u')$$

$$= K(S,u) + C_4 \left[u' \sum_{x=S_1}^{\infty} p(x,u') - S_1 \sum_{x=S_1+1}^{\infty} p(x,u')\right]$$

$$= K(S,u) + C_4 \left[u'p(S_1,u') + u' \sum_{x=S_1+1}^{\infty} p(x,u')\right.$$

$$\left. - S_1 \sum_{x=S_1+1}^{\infty} p(x,u')\right]$$

$$(B4) \qquad = K(S,u) - C_4 \left[(S_1 - u') \sum_{x=S_1+1}^{\infty} p(x,u') - u'p(S_1,u') \right]$$

Substituting S-1 for S in (B3) gives

$$(B5) \quad K_2(S-1,u) = \begin{cases} K(S-1,u) + C_4 \sum_{x=S_1}^{\infty} (x-S_1+1)p(x,u') & \text{if } S \text{ is even} \\ K(S-1,u) + C_4 \sum_{x=S_1+1}^{\infty} (x-S_1)p(x,u') & \text{if } S \text{ is odd} \end{cases}$$

The following results are then obtained by subtracting (B5) from (B3):

If S is odd

$$K_2(S,u) - K_2(S-1,u) = K(S,u) - K(S-1,u)$$

If S is even

$$K_2(S,u) - K_2(S-1,u) = C_1 - (C_1 + C_2) \sum_{x=S}^{\infty} p(x,u)$$

$$+ C_4 \sum_{x=S_1+1}^{\infty} xp(x,u') - C_4 \sum_{x=S_1}^{\infty} xp(x,u') + C_4(S_1-1) \sum_{x=S_1}^{\infty} p(x,u')$$

$$- C_4 S_1 \sum_{x=S_1+1}^{\infty} p(x,u')$$

where the first two terms on the right of the equalty are from Appendix A.

$$= C_1 - (C_1 + C_2) \sum_{x=S}^{\infty} p(x,u) - C_4 S_1 p(S_1,u')$$

$$+ C_4 S_1 \sum_{x=S_1}^{\infty} p(x,u') - C_4 \sum_{x=S_1}^{\infty} p(x,u') - C_4 S_1 \sum_{x=S_1+1}^{\infty} p(x,u')$$

$$= C_1 - (C_1 + C_2) \sum_{x=S}^{\infty} p(x,u) - C_4 S_1 p(S_1,u') + C_4 S_1 p(S_1,u')$$

$$- C_4 \sum_{x=S_1}^{\infty} p(x,u')$$

$$= C_1 - (C_1 + C_2) \sum_{x=S}^{\infty} p(x,u) - C_4 \sum_{x=S_1}^{\infty} p(x,u')$$

$K_2(S,u) - K_2(S-1,u)$ increases as S increases since $\sum_{x=S}^{\infty} p(x,u)$ and $\sum_{x=S_1}^{\infty} p(x,u')$ both decrease as S increases. Therefore, following the same arguments as in Appendix A, the optimal value of S can be shown to be that value which satisfies the following inequalities:

$$\sum_{x=S+1}^{\infty} p(x,u) + \frac{C_4}{C_1+C_2} \sum_{x=S_1+1}^{\infty} p(x,u') < \frac{C_1}{C_1+C_2} < \sum_{x=S}^{\infty} p(x,u)$$

$$+ \frac{C_4}{C_1+C_2} \sum_{x=S_1}^{\infty} p(x,u')$$

```
-COOP,,GRAESSLE,S/1S/2S,7,10000.
-FTN,L,E.
      PROGRAM INV
C
C     PROGRAM DESIGNED TO GENERATE OPTIMAL STOCKAGE OBJECTIVES
C
      DIMENSION C1(8),C2(8),C3(8,8)
      DIMENSION FACT(31)
      READ 1, (C1(M),M=1,8),(C2(N),N=1,8)
    1 FORMAT(8F10.5)
C
C     ESTABLISH FACTORIAL TABLE - INDEX ADVANCED BY ONE TO ACCOUNT FOR
C     ZERO FACTORIAL
C
      FACT(1) = 1.
      DO 2 IFT = 1,30
    2 FACT (IFT+1) = FACT (IFT)*IFT
      DO 15 L=1,50
C
C     U EQUALS MEAN SYSTEM DEMAND PER P.L.T.
C
      U= L*.1
      PRINT 10,U
   10 FORMAT(1H1//////22X,36HMEAN DEMAND VALUE PER P.L.T. EQUALS F3.1///
     116X,52HHOLDING     OUTAGE   C1/(C1+C2)  STOCKAGE   VARIABLE/
     216X,50HCOST(C1)   COST(C2)              OBJECTIVE    COST/
      DO15 M=1,8
      DO15 N=1,8
C
C     C3 EQUALS THE RATIO OF CARRYING COST TO CARRYING PLUS OUTAGE COSTS
C
      C3(M,N)=C1(M)/(C1(M)+C2(N))
C
C     CUMULATIVE POISSON TABLE GENERATOR
C
      POIS=0.
```

```
      DO 100 I=1,30
      J=I-1
C
C     FACTORIAL INDEX ADVANCED BY ONE TO CORRESPOND WITH TABLE
C
      POIS=POIS+(U**J)*(EXPF(-U))/FACT(J+1)
      IF (1.-(POIS+C3(M,N))) 110,100,100
C
C     LS EQUALS OPTIMAL STOCKAGE OBJECTIVE
C
  110 LS=J
      GO TO 200
  100 CONTINUE
 1000 CALL ERR
      LS=30
  200 POIS3=0.
      IF (LS) 1000, 203, 205
  203 TCOST=-U*(C1(M)-(C1(M)+C2(N)))
      GO TO 290
  205 LS1=LS-1
      DO 210 J=0,LS1
  210 POIS3=POIS3+(U**J)*(EXPF(-U))/FACT(J+1)
      POIS2=POIS3+(U**LS)*(EXPF(-U))/FACT(LS+1)
C
C     TCOST EQUALS THE TOTAL MINIMUM VARIABLE COSTS
C
      TCOST = LS*(C1(M)-(C1(M)+C2(N))*(1.-POIS2))-U*(C1(M)-(C1(M)+
     1C2(N))*(1.-POIS3))
  290 PRINT 300, C1(M),C2(N),C3(M,N),LS,TCOST
  300 FORMAT(F22.2,F12.2,F10.3,I10,F13.2)
   15 CONTINUE
      END
      SUBROUTINE ERR
      PRINT 1010
 1010 FORMAT(15H INCORRECT COMP)
      END
```

```
          END
          FINIS
-EXECUTE.
        2.         5.        10.        15.        20.        30.        50.       100.
       20.        50.       100.       500.      1000.      5000.     10000.     25000.
```

APPENDIX D

COMPUTER PROGRAM FOR EVALUATING EFFECT

OF TWO DEPOT SYSTEM

```
-COOP,,GRAESSLE,S/1S/2S,30,20000.
-FTN,L,E.
      PROGRAM COMPARE
C
C     PROGRAM TO DETERMINE SENSITIVITY OF TWO DEPOT SYSTEM VS. ONE DEPOT SYSTEM.
C
      DIMENSION C1(8), C2(8), C3(8,8), C4(8), C5(8,8)
      DIMENSION FACT (31)
      READ 1, (C1(M),M=1,8), (C2(N),N=1,8)
    1 FORMAT (8F10.5)
      FACT (1) = 1.
      DO 2 IFT = 1,30
    2 FACT(IFT+1) = FACT(IFT)*IFT
      DO 15 LA=1,6
      AC = 15. *LA
      DO 15 L=1,50
      U= L*.1
      PRINT 10,U,AC
   10 FORMAT (////15X,36HMEAN DEMAND VALUE PER P.L.T. EQUALS F3.1///
     315X,48HRATIO OF PLT TO HALF REDISTRIBUTION TIME EQUALS F4.1///
     114X,2HC1,8X,2HC2,8X,2HC3,8X,2HC4,8X,2HC5,8X,2HLS,7X,3HLSF,7X,3HLSN
     2,5X,5HTCOST,5X,6HTTCOST/)
      DO 15 M=1,8
      DO 15 N=1,8
      C3(M,N)=C1(M)/(C1(M)+C2(N))
      POIS=0.
      DO 100 I=1,30
      J=I-1
      POIS=POIS+(U**J)*(EXPF(-U))/FACT(J+1)
      IF (1.-(POIS+C3(M,N))) 110,100,100
  110 LS=J
      GO TO 200
  100 CONTINUE
 1000 CALL ERR
      STOP
  200 C4(N) = 2. *(20.+C2(N))
```

```
      C5(M,N) = C4(N)/(C1(M)+C2(N))
      POIS4=0.
      POIS5=0.
      DO 215 I=1,30
      J=I-1
      B=J
      K=J/2
      B1=B/2.
      IF (B1-K) 1000,25,26
   25 POIS5=POIS5+((U/AC)**K)*(EXPF(-U/AC ))/FACT(K+1)
   26 POIS4=POIS4+(U**J)*(EXPF(-U))/FACT(J+1)
      IF ((1.-POIS4)+(C5(M,N)*(1.-POIS5))-C3(M,N)) 214,215,215
  214 LSF=J
      LSN=K
      GO TO 190
  215 CONTINUE
      GO TO 1000
  190 POIS3=0.
      IF (LS) 1000, 203, 205
  203 TCOST=-U*(C1(M)-(C1(M)+C2(N)))
      GO TO 290
  205 LS1=LS-1
      DO 210 J=0,LS1
  210 POIS3=POIS3+(U**J)*(EXPF(-U))/FACT(J+1)
      POIS2=POIS3+(U**LS)*(EXPF(-U))/FACT(LS+1)
      TCOST = LS*(C1(M)-(C1(M)+C2(N))*(1.-POIS2))-U*(C1(M)-(C1(M)+
     1C2(N))*(1.-POIS3))
  290 POIS6=0.
      IF(LSN)1000,403,405
  403 TTCOST = TCOST +C4( N)*(U/AC)
      GO TO 49
  405 DO 410 J=0,LSN
  410 POIS6=POIS6+((U/AC)**J)*(EXPF(-U/AC))/FACT(J+1)
      TTCOST=TCOST-C4( N)*((1.-POIS6)*(LSN-(U/AC))-(U/AC)*((U/AC)**LSN)
     1*(EXPF(-U/AC))/FACT(LSN+1))
   49 IF (LS-LSF) 500,50,500
```

```
   50 IF(( TTCOST-TCOST)-.1*TCOST) 15,15,500
C
C      C1 = CARRYING COST
C      C2 = SYSTEM OUTAGE COST
C      C3 = C1/(C1 + C2)
C      C4 = DEPOT OUTAGE COST
C      C5 = C4/(C1 + C2)
C      LS = SYSTEM STOCKAGE OBJECTIVE FOR ONE DEPOT SYSTEM
C      LSF = SYSTEM STOCKAGE OBJECTIVE FOR TWO DEPOT SYSTEM
C      LSN = STOCKAGE OBJECTIVE AT DEPOT ONE
C      TCOST = TOTAL VARIABLE COST ONE DEPOT SYSTEM
C      TTCOST = TOTAL VARIABLE COST TWO DEPOT SYSTEM
C
  500 PRINT 501,C1(M),C2(N),C3(M,N),C4(N),C5(M,N),LS,LSF,LSN,TCOST,
     1TTCOST
  501 FORMAT (F18.2,F10.2,F10.3,F10.2,F10.3,I9,I10,I10,F10.3,F11.3)
   15 CONTINUE
      END
      SUBROUTINE ERR
      PRINT 1010
 1010 FORMAT(15H INCORRECT COMP)
      END
         END
         FINIS
-EXECUTE.
       2.        5.       10.       15.       20.       30.       50.      100.
      20.       50.      100.      500.     1000.     5000.    10000.    25000.
```

TABLE I

OPTIMAL STOCKAGE OBJECTIVE TABLES

MEAN DEMAND VALUE PER P.L.T. EQUALS .1

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	1	1.91
2.00	50.00	.038	1	2.05
2.00	100.00	.020	1	2.29
2.00	500.00	.004	2	3.88
2.00	1000.00	.002	2	3.96
2.00	5000.00	.000	2	4.59
2.00	10000.00	.000	2	5.39
2.00	25000.00	.000	3	5.90
5.00	20.00	.200	0	2.00
5.00	50.00	.091	1	4.77
5.00	100.00	.048	1	5.01
5.00	500.00	.010	1	6.94
5.00	1000.00	.005	1	9.36
5.00	5000.00	.001	2	10.29
5.00	10000.00	.000	2	11.09
5.00	25000.00	.000	2	13.47
10.00	20.00	.333	0	2.00
10.00	50.00	.167	0	5.00
10.00	100.00	.091	1	9.53
10.00	500.00	.020	1	11.47
10.00	1000.00	.010	1	13.89
10.00	5000.00	.002	2	19.79
10.00	10000.00	.001	2	20.59
10.00	25000.00	.000	2	22.97
15.00	20.00	.429	0	2.00
15.00	50.00	.231	0	5.00
15.00	100.00	.130	0	10.00
15.00	500.00	.029	1	15.99
15.00	1000.00	.015	1	18.41
15.00	5000.00	.003	2	29.30
15.00	10000.00	.001	2	30.09
15.00	25000.00	.001	2	32.47
20.00	20.00	.500	0	2.00
20.00	50.00	.286	0	5.00
20.00	100.00	.167	0	10.00
20.00	500.00	.038	1	20.52
20.00	1000.00	.020	1	22.93
20.00	5000.00	.004	2	38.80
20.00	10000.00	.002	2	39.59
20.00	25000.00	.001	2	41.97
30.00	20.00	.600	0	2.00
30.00	50.00	.375	0	5.00
30.00	100.00	.231	0	10.00
30.00	500.00	.057	1	29.56
30.00	1000.00	.029	1	31.98
30.00	5000.00	.006	1	51.33
30.00	10000.00	.003	2	58.59
30.00	25000.00	.001	2	60.97
50.00	20.00	.714	0	2.00
50.00	50.00	.500	0	5.00
50.00	100.00	.333	0	10.00
50.00	500.00	.091	1	47.66
50.00	1000.00	.048	1	50.08
50.00	5000.00	.010	1	69.43
50.00	10000.00	.005	1	93.62
50.00	25000.00	.002	2	98.97
100.00	20.00	.833	0	2.00
100.00	50.00	.667	0	5.00
100.00	100.00	.500	0	10.00
100.00	500.00	.167	0	50.00
100.00	1000.00	.091	1	95.32
100.00	5000.00	.020	1	114.67
100.00	10000.00	.010	1	138.86
100.00	25000.00	.004	2	193.98

MEAN DEMAND VALUE PER P.L.T. EQUALS .2

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	1	2.01
2.00	50.00	.038	1	2.57
2.00	100.00	.020	1	3.51
2.00	500.00	.004	2	4.21
2.00	1000.00	.002	2	4.81
2.00	5000.00	.000	3	5.90
2.00	10000.00	.000	3	6.19
2.00	25000.00	.000	3	7.08
5.00	20.00	.200	0	4.00
5.00	50.00	.091	1	5.03
5.00	100.00	.048	1	5.97
5.00	500.00	.010	2	9.61
5.00	1000.00	.005	2	10.21
5.00	5000.00	.001	3	14.30
5.00	10000.00	.000	3	14.59
5.00	25000.00	.000	3	15.48
10.00	20.00	.333	0	4.00
10.00	50.00	.167	1	9.12
10.00	100.00	.091	1	10.06
10.00	500.00	.020	1	17.55
10.00	1000.00	.010	2	19.22
10.00	5000.00	.002	2	24.05
10.00	10000.00	.001	3	28.59
10.00	25000.00	.000	3	29.48
15.00	20.00	.429	0	4.00
15.00	50.00	.231	0	10.00
15.00	100.00	.130	1	14.15
15.00	500.00	.029	1	21.65
15.00	1000.00	.015	2	28.23
15.00	5000.00	.003	2	33.06
15.00	10000.00	.001	2	39.09
15.00	25000.00	.001	3	43.48
20.00	20.00	.500	0	4.00
20.00	50.00	.286	0	10.00
20.00	100.00	.167	1	18.25
20.00	500.00	.038	1	25.74
20.00	1000.00	.020	1	35.11
20.00	5000.00	.004	2	42.06
20.00	10000.00	.002	2	48.10
20.00	25000.00	.001	3	57.48
30.00	20.00	.600	0	4.00
30.00	50.00	.375	0	10.00
30.00	100.00	.231	0	20.00
30.00	500.00	.057	1	33.93
30.00	1000.00	.029	1	43.29
30.00	5000.00	.006	2	60.07
30.00	10000.00	.003	2	66.11
30.00	25000.00	.001	2	84.23
50.00	20.00	.714	0	4.00
50.00	50.00	.500	0	10.00
50.00	100.00	.333	0	20.00
50.00	500.00	.091	1	50.30
50.00	1000.00	.048	1	59.67
50.00	5000.00	.010	2	96.10
50.00	10000.00	.005	2	102.14
50.00	25000.00	.002	2	120.25
100.00	20.00	.833	0	4.00
100.00	50.00	.667	0	10.00
100.00	100.00	.500	0	20.00
100.00	500.00	.167	1	91.24
100.00	1000.00	.091	1	100.60
100.00	5000.00	.020	1	175.53
100.00	10000.00	.010	2	192.20
100.00	25000.00	.004	2	210.31

MEAN DEMAND VALUE PER P.L.T. EQUALS .3

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	1	2.30
2.00	50.00	.038	1	3.52
2.00	100.00	.020	2	3.80
2.00	500.00	.004	2	5.35
2.00	1000.00	.002	3	5.68
2.00	5000.00	.000	3	6.81
2.00	10000.00	.000	4	7.57
2.00	25000.00	.000	4	7.82
5.00	20.00	.200	1	4.52
5.00	50.00	.091	1	5.75
5.00	100.00	.048	1	7.79
5.00	500.00	.010	2	10.46
5.00	1000.00	.005	2	12.40
5.00	5000.00	.001	3	14.91
5.00	10000.00	.000	3	16.33
5.00	25000.00	.000	4	18.92
10.00	20.00	.333	0	6.00
10.00	50.00	.167	1	9.45
10.00	100.00	.091	1	11.49
10.00	500.00	.020	2	18.98
10.00	1000.00	.010	2	20.92
10.00	5000.00	.002	3	28.41
10.00	10000.00	.001	3	29.83
10.00	25000.00	.000	3	34.06
15.00	20.00	.429	0	6.00
15.00	50.00	.231	1	13.15
15.00	100.00	.130	1	15.19
15.00	500.00	.029	2	27.50
15.00	1000.00	.015	2	29.44
15.00	5000.00	.003	3	41.92
15.00	10000.00	.001	3	43.33
15.00	25000.00	.001	3	47.56
20.00	20.00	.500	0	6.00
20.00	50.00	.286	0	15.00
20.00	100.00	.167	1	18.90
20.00	500.00	.038	1	35.23
20.00	1000.00	.020	2	37.96
20.00	5000.00	.004	2	53.49
20.00	10000.00	.002	3	56.83
20.00	25000.00	.001	3	61.07
30.00	20.00	.600	0	6.00
30.00	50.00	.375	0	15.00
30.00	100.00	.231	1	26.31
30.00	500.00	.057	1	42.63
30.00	1000.00	.029	2	55.00
30.00	5000.00	.006	2	70.53
30.00	10000.00	.003	3	83.83
30.00	25000.00	.001	3	88.07
50.00	20.00	.714	0	6.00
50.00	50.00	.500	0	15.00
50.00	100.00	.333	0	30.00
50.00	500.00	.091	1	57.45
50.00	1000.00	.048	1	77.86
50.00	5000.00	.010	2	104.60
50.00	10000.00	.005	2	124.01
50.00	25000.00	.002	3	142.07
100.00	20.00	.833	0	6.00
100.00	50.00	.667	0	15.00
100.00	100.00	.500	0	30.00
100.00	500.00	.167	1	94.49
100.00	1000.00	.091	1	114.90
100.00	5000.00	.020	2	189.80
100.00	10000.00	.010	2	209.21
100.00	25000.00	.004	2	267.44

MEAN DEMAND VALUE PER P.L.T. EQUALS .4

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	1	2.75
2.00	50.00	.038	2	3.66
2.00	100.00	.020	2	4.09
2.00	500.00	.004	3	5.62
2.00	1000.00	.002	3	6.04
2.00	5000.00	.000	4	7.53
2.00	10000.00	.000	4	7.86
2.00	25000.00	.000	4	8.84
5.00	20.00	.200	1	4.76
5.00	50.00	.091	1	6.87
5.00	100.00	.048	2	8.92
5.00	500.00	.010	2	12.43
5.00	1000.00	.005	3	13.85
5.00	5000.00	.001	3	17.21
5.00	10000.00	.000	4	18.66
5.00	25000.00	.000	4	19.64
10.00	20.00	.333	0	8.00
10.00	50.00	.167	1	10.22
10.00	100.00	.091	1	13.74
10.00	500.00	.020	2	20.47
10.00	1000.00	.010	2	24.86
10.00	5000.00	.002	3	30.22
10.00	10000.00	.001	3	34.43
10.00	25000.00	.000	4	37.64
15.00	20.00	.429	0	8.00
15.00	50.00	.231	1	13.57
15.00	100.00	.130	1	17.09
15.00	500.00	.029	2	28.52
15.00	1000.00	.015	2	32.90
15.00	5000.00	.003	3	43.22
15.00	10000.00	.001	3	47.43
15.00	25000.00	.001	4	55.64
20.00	20.00	.500	0	8.00
20.00	50.00	.286	1	16.92
20.00	100.00	.167	1	20.44
20.00	500.00	.038	2	36.56
20.00	1000.00	.020	2	40.94
20.00	5000.00	.004	3	56.23
20.00	10000.00	.002	3	60.43
20.00	25000.00	.001	3	73.06
30.00	20.00	.600	0	8.00
30.00	50.00	.375	0	20.00
30.00	100.00	.231	1	27.14
30.00	500.00	.057	2	52.65
30.00	1000.00	.029	2	57.03
30.00	5000.00	.006	3	82.23
30.00	10000.00	.003	3	86.44
30.00	25000.00	.001	3	99.07
50.00	20.00	.714	0	8.00
50.00	50.00	.500	0	20.00
50.00	100.00	.333	0	40.00
50.00	500.00	.091	1	68.68
50.00	1000.00	.048	2	89.21
50.00	5000.00	.010	2	124.28
50.00	10000.00	.005	3	138.46
50.00	25000.00	.002	3	151.09
100.00	20.00	.833	0	8.00
100.00	50.00	.667	0	20.00
100.00	100.00	.500	0	40.00
100.00	500.00	.167	1	102.19
100.00	1000.00	.091	1	137.35
100.00	5000.00	.020	2	204.72
100.00	10000.00	.010	2	248.56
100.00	25000.00	.004	3	281.13

MEAN DEMAND VALUE PER P.L.T. EQUALS .5

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	1	3.34
2.00	50.00	.038	2	3.85
2.00	100.00	.020	2	4.67
2.00	500.00	.004	3	5.97
2.00	1000.00	.002	3	6.94
2.00	5000.00	.000	4	7.94
2.00	10000.00	.000	4	8.87
2.00	25000.00	.000	5	9.38
5.00	20.00	.200	1	5.16
5.00	50.00	.091	1	8.36
5.00	100.00	.048	2	9.21
5.00	500.00	.010	3	13.48
5.00	1000.00	.005	3	14.45
5.00	5000.00	.001	4	18.44
5.00	10000.00	.000	4	19.37
5.00	25000.00	.000	4	22.18
10.00	20.00	.333	1	8.20
10.00	50.00	.167	1	11.39
10.00	100.00	.091	1	16.72
10.00	500.00	.020	2	23.33
10.00	1000.00	.010	3	26.96
10.00	5000.00	.002	3	34.71
10.00	10000.00	.001	4	36.88
10.00	25000.00	.000	4	39.69
15.00	20.00	.429	0	10.00
15.00	50.00	.231	1	14.42
15.00	100.00	.130	1	19.75
15.00	500.00	.029	2	30.91
15.00	1000.00	.015	2	39.07
15.00	5000.00	.003	3	47.22
15.00	10000.00	.001	4	54.38
15.00	25000.00	.001	4	57.19
20.00	20.00	.500	0	10.00
20.00	50.00	.286	1	17.46
20.00	100.00	.167	1	22.78
20.00	500.00	.038	2	38.49
20.00	1000.00	.020	2	46.65
20.00	5000.00	.004	3	59.73
20.00	10000.00	.002	3	69.43
20.00	25000.00	.001	4	74.69
30.00	20.00	.600	0	10.00
30.00	50.00	.375	1	23.52
30.00	100.00	.231	1	28.85
30.00	500.00	.057	2	53.65
30.00	1000.00	.029	2	61.82
30.00	5000.00	.006	3	84.75
30.00	10000.00	.003	3	94.45
30.00	25000.00	.001	4	109.69
50.00	20.00	.714	0	10.00
50.00	50.00	.500	0	25.00
50.00	100.00	.333	1	40.98
50.00	500.00	.091	1	83.59
50.00	1000.00	.048	2	92.14
50.00	5000.00	.010	3	134.79
50.00	10000.00	.005	3	144.49
50.00	25000.00	.002	3	173.57
100.00	20.00	.833	0	10.00
100.00	50.00	.667	0	25.00
100.00	100.00	.500	0	50.00
100.00	500.00	.167	1	113.92
100.00	1000.00	.091	1	167.18
100.00	5000.00	.020	2	233.27
100.00	10000.00	.010	3	269.58
100.00	25000.00	.004	3	298.67

MEAN DEMAND VALUE PER P.L.T. EQUALS .6

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	2	3.39
2.00	50.00	.038	2	4.20
2.00	100.00	.020	3	5.19
2.00	500.00	.004	3	6.71
2.00	1000.00	.002	4	7.24
2.00	5000.00	.000	4	8.99
2.00	10000.00	.000	5	9.22
2.00	25000.00	.000	5	9.86
5.00	20.00	.200	1	5.72
5.00	50.00	.091	2	8.48
5.00	100.00	.048	2	9.83
5.00	500.00	.010	3	13.92
5.00	1000.00	.005	3	15.81
5.00	5000.00	.001	4	19.19
5.00	10000.00	.000	4	21.37
5.00	25000.00	.000	5	23.06
10.00	20.00	.333	1	8.46
10.00	50.00	.167	1	12.93
10.00	100.00	.091	2	16.96
10.00	500.00	.020	3	25.94
10.00	1000.00	.010	3	27.83
10.00	5000.00	.002	4	36.19
10.00	10000.00	.001	4	38.37
10.00	25000.00	.000	4	44.93
15.00	20.00	.429	1	11.21
15.00	50.00	.231	1	15.67
15.00	100.00	.130	1	23.11
15.00	500.00	.029	2	34.86
15.00	1000.00	.015	3	39.85
15.00	5000.00	.003	4	53.19
15.00	10000.00	.001	4	55.38
15.00	25000.00	.001	4	61.93
20.00	20.00	.500	0	12.00
20.00	50.00	.286	1	18.42
20.00	100.00	.167	1	25.86
20.00	500.00	.038	2	41.99
20.00	1000.00	.020	3	51.87
20.00	5000.00	.004	3	67.05
20.00	10000.00	.002	4	72.38
20.00	25000.00	.001	4	78.93
30.00	20.00	.600	0	12.00
30.00	50.00	.375	1	23.90
30.00	100.00	.231	1	31.35
30.00	500.00	.057	2	56.26
30.00	1000.00	.029	2	69.72
30.00	5000.00	.006	3	91.09
30.00	10000.00	.003	4	106.38
30.00	25000.00	.001	4	112.94
50.00	20.00	.714	0	12.00
50.00	50.00	.500	0	30.00
50.00	100.00	.333	1	42.32
50.00	500.00	.091	2	84.80
50.00	1000.00	.048	2	98.26
50.00	5000.00	.010	3	139.16
50.00	10000.00	.005	3	158.14
50.00	25000.00	.002	4	180.94
100.00	20.00	.833	0	12.00
100.00	50.00	.667	0	30.00
100.00	100.00	.500	0	60.00
100.00	500.00	.167	1	129.29
100.00	1000.00	.091	2	169.60
100.00	5000.00	.020	3	259.35
100.00	10000.00	.010	3	278.33
100.00	25000.00	.004	3	335.25

MEAN DEMAND VALUE PER P.L.T. EQUALS .7

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	2	3.50
2.00	50.00	.038	2	4.72
2.00	100.00	.020	3	5.28
2.00	500.00	.004	4	7.04
2.00	1000.00	.002	4	7.49
2.00	5000.00	.000	5	9.10
2.00	10000.00	.000	5	9.60
2.00	25000.00	.000	6	10.84
5.00	20.00	.200	1	6.41
5.00	50.00	.091	2	8.74
5.00	100.00	.048	2	10.78
5.00	500.00	.010	3	14.85
5.00	1000.00	.005	4	17.39
5.00	5000.00	.001	4	20.93
5.00	10000.00	.000	5	22.50
5.00	25000.00	.000	5	23.99
10.00	20.00	.333	1	8.90
10.00	50.00	.167	1	14.80
10.00	100.00	.091	2	17.49
10.00	500.00	.020	3	26.39
10.00	1000.00	.010	3	29.71
10.00	5000.00	.002	4	37.44
10.00	10000.00	.001	4	41.86
10.00	25000.00	.000	5	45.49
15.00	20.00	.429	1	11.38
15.00	50.00	.231	1	17.28
15.00	100.00	.130	2	24.19
15.00	500.00	.029	3	37.92
15.00	1000.00	.015	3	41.24
15.00	5000.00	.003	4	53.94
15.00	10000.00	.001	4	58.37
15.00	25000.00	.001	5	67.00
20.00	20.00	.500	1	13.86
20.00	50.00	.286	1	19.76
20.00	100.00	.167	1	29.59
20.00	500.00	.038	2	47.21
20.00	1000.00	.020	3	52.77
20.00	5000.00	.004	4	70.44
20.00	10000.00	.002	4	74.87
20.00	25000.00	.001	4	88.15
30.00	20.00	.600	0	14.00
30.00	50.00	.375	1	24.73
30.00	100.00	.231	1	34.56
30.00	500.00	.057	2	60.61
30.00	1000.00	.029	3	75.84
30.00	5000.00	.006	3	102.39
30.00	10000.00	.003	4	107.88
30.00	25000.00	.001	4	121.16
50.00	20.00	.714	0	14.00
50.00	50.00	.500	1	34.66
50.00	100.00	.333	1	44.49
50.00	500.00	.091	2	87.43
50.00	1000.00	.048	2	107.82
50.00	5000.00	.010	3	148.53
50.00	10000.00	.005	4	173.90
50.00	25000.00	.002	4	187.18
100.00	20.00	.833	0	14.00
100.00	50.00	.667	0	35.00
100.00	100.00	.500	1	69.32
100.00	500.00	.167	1	147.95
100.00	1000.00	.091	2	174.86
100.00	5000.00	.020	3	263.86
100.00	10000.00	.010	3	297.05
100.00	25000.00	.004	4	352.22

MEAN DEMAND VALUE PER P.L.T. EQUALS .8

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	2	3.68
2.00	50.00	.038	3	4.96
2.00	100.00	.020	3	5.49
2.00	500.00	.004	4	7.21
2.00	1000.00	.002	4	8.02
2.00	5000.00	.000	5	9.44
2.00	10000.00	.000	5	10.47
2.00	25000.00	.000	6	10.97
5.00	20.00	.200	1	7.23
5.00	50.00	.091	2	9.20
5.00	100.00	.048	2	12.10
5.00	500.00	.010	3	16.40
5.00	1000.00	.005	4	17.63
5.00	5000.00	.001	5	22.04
5.00	10000.00	.000	5	23.07
5.00	25000.00	.000	5	26.18
10.00	20.00	.333	1	9.48
10.00	50.00	.167	2	15.49
10.00	100.00	.091	2	18.39
10.00	500.00	.020	3	27.46
10.00	1000.00	.010	3	32.81
10.00	5000.00	.002	4	40.11
10.00	10000.00	.001	5	44.08
10.00	25000.00	.000	5	47.19
15.00	20.00	.429	1	11.73
15.00	50.00	.231	1	19.21
15.00	100.00	.130	2	24.68
15.00	500.00	.029	3	38.51
15.00	1000.00	.015	3	43.86
15.00	5000.00	.003	4	56.12
15.00	10000.00	.001	4	64.21
15.00	25000.00	.001	5	68.19
20.00	20.00	.500	1	13.97
20.00	50.00	.286	1	21.45
20.00	100.00	.167	2	30.97
20.00	500.00	.038	3	49.56
20.00	1000.00	.020	3	54.91
20.00	5000.00	.004	4	72.13
20.00	10000.00	.002	4	80.22
20.00	25000.00	.001	5	89.19
30.00	20.00	.600	0	16.00
30.00	50.00	.375	1	25.95
30.00	100.00	.231	1	38.41
30.00	500.00	.057	2	66.80
30.00	1000.00	.029	3	77.02
30.00	5000.00	.006	4	104.14
30.00	10000.00	.003	4	112.24
30.00	25000.00	.001	5	131.19
50.00	20.00	.714	0	16.00
50.00	50.00	.500	1	34.93
50.00	100.00	.333	1	47.40
50.00	500.00	.091	2	91.97
50.00	1000.00	.048	2	121.03
50.00	5000.00	.010	3	164.03
50.00	10000.00	.005	4	176.27
50.00	25000.00	.002	4	200.55
100.00	20.00	.833	0	16.00
100.00	50.00	.667	0	40.00
100.00	100.00	.500	1	69.87
100.00	500.00	.167	2	154.87
100.00	1000.00	.091	2	183.93
100.00	5000.00	.020	3	274.56
100.00	10000.00	.010	3	328.05
100.00	25000.00	.004	4	360.63

MEAN DEMAND VALUE PER P.L.T. EQUALS .9

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	2	3.94
2.00	50.00	.038	3	5.04
2.00	100.00	.020	3	5.85
2.00	500.00	.004	4	7.57
2.00	1000.00	.002	5	8.59
2.00	5000.00	.000	5	10.16
2.00	10000.00	.000	6	10.69
2.00	25000.00	.000	6	11.42
5.00	20.00	.200	2	7.48
5.00	50.00	.091	2	9.85
5.00	100.00	.048	3	12.20
5.00	500.00	.010	4	16.88
5.00	1000.00	.005	4	18.25
5.00	5000.00	.001	5	22.46
5.00	10000.00	.000	5	24.42
5.00	25000.00	.000	6	26.72
10.00	20.00	.333	1	10.20
10.00	50.00	.167	2	15.74
10.00	100.00	.091	2	19.70
10.00	500.00	.020	3	29.26
10.00	1000.00	.010	4	33.76
10.00	5000.00	.002	5	42.97
10.00	10000.00	.001	5	44.93
10.00	25000.00	.000	5	50.81
15.00	20.00	.429	1	12.23
15.00	50.00	.231	1	21.43
15.00	100.00	.130	2	25.59
15.00	500.00	.029	3	39.84
15.00	1000.00	.015	3	47.94
15.00	5000.00	.003	4	60.22
15.00	10000.00	.001	5	65.43
15.00	25000.00	.001	5	71.31
20.00	20.00	.500	1	14.26
20.00	50.00	.286	1	23.46
20.00	100.00	.167	2	31.49
20.00	500.00	.038	3	50.42
20.00	1000.00	.020	3	58.52
20.00	5000.00	.004	4	75.74
20.00	10000.00	.002	5	85.93
20.00	25000.00	.001	5	91.81
30.00	20.00	.600	0	18.00
30.00	50.00	.375	1	27.53
30.00	100.00	.231	1	42.85
30.00	500.00	.057	3	71.58
30.00	1000.00	.029	3	79.68
30.00	5000.00	.006	4	106.76
30.00	10000.00	.003	4	120.45
30.00	25000.00	.001	5	132.82
50.00	20.00	.714	0	18.00
50.00	50.00	.500	1	35.66
50.00	100.00	.333	1	50.99
50.00	500.00	.091	2	98.48
50.00	1000.00	.048	3	122.00
50.00	5000.00	.010	4	168.82
50.00	10000.00	.005	4	182.50
50.00	25000.00	.002	5	214.83
100.00	20.00	.833	0	18.00
100.00	50.00	.667	0	45.00
100.00	100.00	.500	1	71.31
100.00	500.00	.167	2	157.43
100.00	1000.00	.091	2	196.96
100.00	5000.00	.020	3	292.59
100.00	10000.00	.010	4	337.64
100.00	25000.00	.004	4	378.68

MEAN DEMAND VALUE PER P.L.T. EQUALS 1.0

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	2	4.28
2.00	50.00	.038	3	5.21
2.00	100.00	.020	3	6.38
2.00	500.00	.004	4	8.18
2.00	1000.00	.002	5	8.69
2.00	5000.00	.000	6	10.47
2.00	10000.00	.000	6	10.95
2.00	25000.00	.000	7	12.29
5.00	20.00	.200	2	7.59
5.00	50.00	.091	2	10.70
5.00	100.00	.048	3	12.45
5.00	500.00	.010	4	17.20
5.00	1000.00	.005	4	19.37
5.00	5000.00	.001	5	23.45
5.00	10000.00	.000	6	25.95
5.00	25000.00	.000	6	27.37
10.00	20.00	.333	1	11.04
10.00	50.00	.167	2	16.22
10.00	100.00	.091	2	21.40
10.00	500.00	.020	3	31.90
10.00	1000.00	.010	4	34.39
10.00	5000.00	.002	5	43.45
10.00	10000.00	.001	5	46.90
10.00	25000.00	.000	6	52.37
15.00	20.00	.429	1	12.88
15.00	50.00	.231	2	21.74
15.00	100.00	.130	2	26.92
15.00	500.00	.029	3	42.02
15.00	1000.00	.015	4	49.41
15.00	5000.00	.003	5	63.45
15.00	10000.00	.001	5	66.90
15.00	25000.00	.001	5	77.23
20.00	20.00	.500	1	14.72
20.00	50.00	.286	1	25.75
20.00	100.00	.167	2	32.44
20.00	500.00	.038	3	52.14
20.00	1000.00	.020	3	63.80
20.00	5000.00	.004	4	81.83
20.00	10000.00	.002	5	86.90
20.00	25000.00	.001	5	97.24
30.00	20.00	.600	1	18.39
30.00	50.00	.375	1	29.43
30.00	100.00	.231	2	43.47
30.00	500.00	.057	3	72.37
30.00	1000.00	.029	3	84.04
30.00	5000.00	.006	4	111.87
30.00	10000.00	.003	5	126.91
30.00	25000.00	.001	5	137.24
50.00	20.00	.714	0	20.00
50.00	50.00	.500	1	36.79
50.00	100.00	.333	1	55.18
50.00	500.00	.091	2	107.00
50.00	1000.00	.048	3	124.50
50.00	5000.00	.010	4	171.96
50.00	10000.00	.005	4	193.71
50.00	25000.00	.002	5	217.26
100.00	20.00	.833	0	20.00
100.00	50.00	.667	0	50.00
100.00	100.00	.500	1	73.58
100.00	500.00	.167	2	162.18
100.00	1000.00	.091	2	214.00
100.00	5000.00	.020	3	319.02
100.00	10000.00	.010	4	343.92
100.00	25000.00	.004	4	409.15

MEAN DEMAND VALUE PER P.L.T. EQUALS 1.1

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	3	4.51
2.00	50.00	.038	3	5.48
2.00	100.00	.020	4	6.47
2.00	500.00	.004	5	8.37
2.00	1000.00	.002	5	8.94
2.00	5000.00	.000	6	10.66
2.00	10000.00	.000	6	11.52
2.00	25000.00	.000	7	12.37
5.00	20.00	.200	2	7.80
5.00	50.00	.091	3	11.28
5.00	100.00	.048	3	12.89
5.00	500.00	.010	4	17.82
5.00	1000.00	.005	5	20.65
5.00	5000.00	.001	5	25.20
5.00	10000.00	.000	6	26.22
5.00	25000.00	.000	6	28.79
10.00	20.00	.333	1	11.99
10.00	50.00	.167	2	16.91
10.00	100.00	.091	3	22.55
10.00	500.00	.020	4	32.35
10.00	1000.00	.010	4	35.64
10.00	5000.00	.002	5	44.71
10.00	10000.00	.001	5	50.41
10.00	25000.00	.000	6	53.29
15.00	20.00	.429	1	13.65
15.00	50.00	.231	2	22.07
15.00	100.00	.130	2	28.67
15.00	500.00	.029	3	45.14
15.00	1000.00	.015	4	50.17
15.00	5000.00	.003	5	64.21
15.00	10000.00	.001	5	69.91
15.00	25000.00	.001	6	77.79
20.00	20.00	.500	1	15.31
20.00	50.00	.286	2	27.23
20.00	100.00	.167	2	33.83
20.00	500.00	.038	3	54.80
20.00	1000.00	.020	4	64.71
20.00	5000.00	.004	5	83.72
20.00	10000.00	.002	5	89.42
20.00	25000.00	.001	6	102.30
30.00	20.00	.600	1	18.64
30.00	50.00	.375	1	31.63
30.00	100.00	.231	2	44.15
30.00	500.00	.057	3	74.13
30.00	1000.00	.029	3	90.29
30.00	5000.00	.006	4	120.07
30.00	10000.00	.003	5	128.43
30.00	25000.00	.001	5	145.52
50.00	20.00	.714	0	22.00
50.00	50.00	.500	1	38.29
50.00	100.00	.333	1	59.93
50.00	500.00	.091	3	112.77
50.00	1000.00	.048	3	128.93
50.00	5000.00	.010	4	178.20
50.00	10000.00	.005	5	206.45
50.00	25000.00	.002	5	223.55
100.00	20.00	.833	0	22.00
100.00	50.00	.667	1	54.93
100.00	100.00	.500	1	76.57
100.00	500.00	.167	2	169.14
100.00	1000.00	.091	3	225.55
100.00	5000.00	.020	4	323.53
100.00	10000.00	.010	4	356.41
100.00	25000.00	.004	5	418.60

MEAN DEMAND VALUE PER P.L.T. EQUALS 1.2

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	3	4.55
2.00	50.00	.038	3	5.85
2.00	100.00	.020	4	6.57
2.00	500.00	.004	5	8.50
2.00	1000.00	.002	5	9.40
2.00	5000.00	.000	6	11.07
2.00	10000.00	.000	7	12.02
2.00	25000.00	.000	7	12.66
5.00	20.00	.200	2	8.10
5.00	50.00	.091	3	11.38
5.00	100.00	.048	3	13.55
5.00	500.00	.010	4	18.82
5.00	1000.00	.005	5	20.80
5.00	5000.00	.001	6	25.47
5.00	10000.00	.000	6	26.94
5.00	25000.00	.000	7	30.06
10.00	20.00	.333	2	12.91
10.00	50.00	.167	2	17.83
10.00	100.00	.091	3	22.76
10.00	500.00	.020	4	32.87
10.00	1000.00	.010	4	37.64
10.00	5000.00	.002	5	46.99
10.00	10000.00	.001	6	50.94
10.00	25000.00	.000	6	55.34
15.00	20.00	.429	1	14.54
15.00	50.00	.231	2	22.65
15.00	100.00	.130	2	30.84
15.00	500.00	.029	4	46.91
15.00	1000.00	.015	4	51.68
15.00	5000.00	.003	5	66.00
15.00	10000.00	.001	6	74.94
15.00	25000.00	.001	6	79.34
20.00	20.00	.500	1	16.05
20.00	50.00	.286	2	27.47
20.00	100.00	.167	2	35.66
20.00	500.00	.038	3	58.52
20.00	1000.00	.020	4	65.73
20.00	5000.00	.004	5	85.00
20.00	10000.00	.002	5	93.97
20.00	25000.00	.001	6	103.35
30.00	20.00	.600	1	19.06
30.00	50.00	.375	1	34.10
30.00	100.00	.231	2	45.30
30.00	500.00	.057	3	76.95
30.00	1000.00	.029	4	93.83
30.00	5000.00	.006	5	123.02
30.00	10000.00	.003	5	131.99
30.00	25000.00	.001	6	151.35
50.00	20.00	.714	0	24.00
50.00	50.00	.500	1	40.12
50.00	100.00	.333	2	64.57
50.00	500.00	.091	3	113.82
50.00	1000.00	.048	3	135.47
50.00	5000.00	.010	4	188.18
50.00	10000.00	.005	5	208.03
50.00	25000.00	.002	5	234.94
100.00	20.00	.833	0	24.00
100.00	50.00	.667	1	55.18
100.00	100.00	.500	1	80.24
100.00	500.00	.167	2	178.29
100.00	1000.00	.091	3	227.64
100.00	5000.00	.020	4	328.65
100.00	10000.00	.010	4	376.35
100.00	25000.00	.004	5	425.02

MEAN DEMAND VALUE PER P.L.T. EQUALS 1.3

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	3	4.64
2.00	50.00	.038	4	6.10
2.00	100.00	.020	4	6.76
2.00	500.00	.004	5	8.76
2.00	1000.00	.002	6	9.88
2.00	5000.00	.000	7	11.77
2.00	10000.00	.000	7	12.15
2.00	25000.00	.000	7	13.27
5.00	20.00	.200	2	8.48
5.00	50.00	.091	3	11.61
5.00	100.00	.048	3	14.43
5.00	500.00	.010	5	19.87
5.00	1000.00	.005	5	21.22
5.00	5000.00	.001	6	25.89
5.00	10000.00	.000	6	28.29
5.00	25000.00	.000	7	30.37
10.00	20.00	.333	2	12.98
10.00	50.00	.167	2	18.96
10.00	100.00	.091	3	23.21
10.00	500.00	.020	4	33.82
10.00	1000.00	.010	5	39.74
10.00	5000.00	.002	6	49.40
10.00	10000.00	.001	6	51.79
10.00	25000.00	.000	7	58.87
15.00	20.00	.429	1	15.54
15.00	50.00	.231	2	23.46
15.00	100.00	.130	3	31.99
15.00	500.00	.029	4	47.39
15.00	1000.00	.015	4	54.07
15.00	5000.00	.003	5	69.09
15.00	10000.00	.001	6	75.29
15.00	25000.00	.001	6	82.47
20.00	20.00	.500	1	16.90
20.00	50.00	.286	2	27.95
20.00	100.00	.167	2	37.92
20.00	500.00	.038	4	60.95
20.00	1000.00	.020	4	67.64
20.00	5000.00	.004	5	87.60
20.00	10000.00	.002	6	98.79
20.00	25000.00	.001	6	105.97
30.00	20.00	.600	1	19.63
30.00	50.00	.375	1	36.80
30.00	100.00	.231	2	46.92
30.00	500.00	.057	3	80.93
30.00	1000.00	.029	4	94.77
30.00	5000.00	.006	5	124.63
30.00	10000.00	.003	5	138.17
30.00	25000.00	.001	6	152.97
50.00	20.00	.714	1	25.08
50.00	50.00	.500	1	42.25
50.00	100.00	.333	2	64.90
50.00	500.00	.091	3	116.06
50.00	1000.00	.048	3	144.29
50.00	5000.00	.010	5	198.68
50.00	10000.00	.005	5	212.22
50.00	25000.00	.002	6	246.98
100.00	20.00	.833	0	26.00
100.00	50.00	.667	1	55.88
100.00	100.00	.500	1	84.51
100.00	500.00	.167	2	189.61
100.00	1000.00	.091	3	232.11
100.00	5000.00	.020	4	338.20
100.00	10000.00	.010	5	397.36
100.00	25000.00	.004	5	437.99

MEAN DEMAND VALUE PER P.L.T. EQUALS 1.4

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	3	4.78
2.00	50.00	.038	4	6.15
2.00	100.00	.020	4	7.06
2.00	500.00	.004	5	9.18
2.00	1000.00	.002	6	9.95
2.00	5000.00	.000	7	11.83
2.00	10000.00	.000	7	12.45
2.00	25000.00	.000	8	13.67
5.00	20.00	.200	2	8.96
5.00	50.00	.091	3	11.96
5.00	100.00	.048	4	14.91
5.00	500.00	.010	5	19.99
5.00	1000.00	.005	5	21.97
5.00	5000.00	.001	6	26.74
5.00	10000.00	.000	7	29.25
5.00	25000.00	.000	7	31.14
10.00	20.00	.333	2	13.15
10.00	50.00	.167	2	20.31
10.00	100.00	.091	3	23.91
10.00	500.00	.020	4	35.28
10.00	1000.00	.010	5	39.99
10.00	5000.00	.002	6	49.75
10.00	10000.00	.001	6	53.48
10.00	25000.00	.000	7	59.14
15.00	20.00	.429	1	16.63
15.00	50.00	.231	2	24.50
15.00	100.00	.130	3	32.27
15.00	500.00	.029	4	48.37
15.00	1000.00	.015	4	57.48
15.00	5000.00	.003	6	72.75
15.00	10000.00	.001	6	76.49
15.00	25000.00	.001	7	87.14
20.00	20.00	.500	1	17.86
20.00	50.00	.286	2	28.69
20.00	100.00	.167	2	40.61
20.00	500.00	.038	4	61.47
20.00	1000.00	.020	4	70.57
20.00	5000.00	.004	5	91.82
20.00	10000.00	.002	6	99.49
20.00	25000.00	.001	6	110.71
30.00	20.00	.600	1	20.33
30.00	50.00	.375	2	37.07
30.00	100.00	.231	2	49.00
30.00	500.00	.057	3	86.12
30.00	1000.00	.029	4	96.75
30.00	5000.00	.006	5	127.86
30.00	10000.00	.003	6	145.50
30.00	25000.00	.001	6	156.72
50.00	20.00	.714	1	25.26
50.00	50.00	.500	1	44.66
50.00	100.00	.333	2	65.76
50.00	500.00	.091	3	119.56
50.00	1000.00	.048	4	149.11
50.00	5000.00	.010	5	199.94
50.00	10000.00	.005	5	219.69
50.00	25000.00	.002	6	248.73
100.00	20.00	.833	0	28.00
100.00	50.00	.667	1	56.99
100.00	100.00	.500	1	89.32
100.00	500.00	.167	2	203.06
100.00	1000.00	.091	3	239.12
100.00	5000.00	.020	4	352.83
100.00	10000.00	.010	5	399.88
100.00	25000.00	.004	5	459.12

MEAN DEMAND VALUE PER P.L.T. EQUALS 1.5

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	3	4.98
2.00	50.00	.038	4	6.26
2.00	100.00	.020	4	7.46
2.00	500.00	.004	6	9.57
2.00	1000.00	.002	6	10.13
2.00	5000.00	.000	7	12.01
2.00	10000.00	.000	7	13.02
2.00	25000.00	.000	8	13.81
5.00	20.00	.200	2	9.52
5.00	50.00	.091	3	12.44
5.00	100.00	.048	4	15.04
5.00	500.00	.010	5	20.32
5.00	1000.00	.005	5	23.11
5.00	5000.00	.001	6	28.15
5.00	10000.00	.000	7	29.52
5.00	25000.00	.000	7	32.55
10.00	20.00	.333	2	13.43
10.00	50.00	.167	3	20.39
10.00	100.00	.091	3	24.88
10.00	500.00	.020	4	37.32
10.00	1000.00	.010	5	40.64
10.00	5000.00	.002	6	50.65
10.00	10000.00	.001	6	56.29
10.00	25000.00	.000	7	60.05
15.00	20.00	.429	2	17.33
15.00	50.00	.231	2	25.76
15.00	100.00	.130	3	32.83
15.00	500.00	.029	4	49.94
15.00	1000.00	.015	5	58.17
15.00	5000.00	.003	6	73.16
15.00	10000.00	.001	6	78.80
15.00	25000.00	.001	7	87.55
20.00	20.00	.500	1	18.93
20.00	50.00	.286	2	29.67
20.00	100.00	.167	3	40.78
20.00	500.00	.038	4	62.56
20.00	1000.00	.020	4	74.64
20.00	5000.00	.004	6	95.66
20.00	10000.00	.002	6	101.30
20.00	25000.00	.001	7	115.05
30.00	20.00	.600	1	21.16
30.00	50.00	.375	2	37.48
30.00	100.00	.231	2	51.52
30.00	500.00	.057	4	87.80
30.00	1000.00	.029	4	99.88
30.00	5000.00	.006	5	133.09
30.00	10000.00	.003	6	146.31
30.00	25000.00	.001	6	163.23
50.00	20.00	.714	1	25.62
50.00	50.00	.500	1	47.31
50.00	100.00	.333	2	67.14
50.00	500.00	.091	3	124.39
50.00	1000.00	.048	4	150.37
50.00	5000.00	.010	5	203.20
50.00	10000.00	.005	5	231.12
50.00	25000.00	.002	6	253.26
100.00	20.00	.833	0	30.00
100.00	50.00	.667	1	58.47
100.00	100.00	.500	1	94.63
100.00	500.00	.167	3	203.88
100.00	1000.00	.091	3	248.78
100.00	5000.00	.020	4	373.22
100.00	10000.00	.010	5	406.40
100.00	25000.00	.004	6	478.31

MEAN DEMAND VALUE PER P.L.T. EQUALS 1.6

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	3	5.22
2.00	50.00	.038	4	6.43
2.00	100.00	.020	5	7.58
2.00	500.00	.004	6	9.63
2.00	1000.00	.002	6	10.45
2.00	5000.00	.000	7	12.37
2.00	10000.00	.000	8	13.34
2.00	25000.00	.000	8	14.14
5.00	20.00	.200	3	9.75
5.00	50.00	.091	3	13.06
5.00	100.00	.048	4	15.29
5.00	500.00	.010	5	20.88
5.00	1000.00	.005	6	23.66
5.00	5000.00	.001	7	28.57
5.00	10000.00	.000	7	30.14
5.00	25000.00	.000	8	33.34
10.00	20.00	.333	2	13.80
10.00	50.00	.167	3	20.61
10.00	100.00	.091	3	26.12
10.00	500.00	.020	5	37.92
10.00	1000.00	.010	5	41.77
10.00	5000.00	.002	6	52.27
10.00	10000.00	.001	7	57.14
10.00	25000.00	.000	7	61.86
15.00	20.00	.429	2	17.44
15.00	50.00	.231	2	27.24
15.00	100.00	.130	3	33.67
15.00	500.00	.029	4	52.16
15.00	1000.00	.015	5	58.81
15.00	5000.00	.003	6	74.27
15.00	10000.00	.001	6	82.52
15.00	25000.00	.001	7	88.86
20.00	20.00	.500	1	20.08
20.00	50.00	.286	2	30.88
20.00	100.00	.167	3	41.22
20.00	500.00	.038	4	64.31
20.00	1000.00	.020	5	75.84
20.00	5000.00	.004	6	96.28
20.00	10000.00	.002	6	104.53
20.00	25000.00	.001	7	115.86
30.00	20.00	.600	1	22.09
30.00	50.00	.375	2	38.15
30.00	100.00	.231	2	54.49
30.00	500.00	.057	4	88.63
30.00	1000.00	.029	4	104.31
30.00	5000.00	.006	6	140.30
30.00	10000.00	.003	6	148.55
30.00	25000.00	.001	7	169.86
50.00	20.00	.714	1	26.13
50.00	50.00	.500	1	50.19
50.00	100.00	.333	2	69.02
50.00	500.00	.091	3	130.60
50.00	1000.00	.048	4	152.94
50.00	5000.00	.010	5	208.84
50.00	10000.00	.005	6	236.58
50.00	25000.00	.002	6	261.33
100.00	20.00	.833	0	32.00
100.00	50.00	.667	1	60.28
100.00	100.00	.500	1	100.38
100.00	500.00	.167	3	206.11
100.00	1000.00	.091	3	261.20
100.00	5000.00	.020	5	379.22
100.00	10000.00	.010	5	417.67
100.00	25000.00	.004	6	481.41

MEAN DEMAND VALUE PER P.L.T. EQUALS 1.7

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	4	5.48
2.00	50.00	.038	4	6.68
2.00	100.00	.020	5	7.66
2.00	500.00	.004	6	9.78
2.00	1000.00	.002	6	10.95
2.00	5000.00	.000	7	12.97
2.00	10000.00	.000	8	13.46
2.00	25000.00	.000	8	14.74
5.00	20.00	.200	3	9.83
5.00	50.00	.091	4	13.70
5.00	100.00	.048	4	15.70
5.00	500.00	.010	5	21.73
5.00	1000.00	.005	6	23.86
5.00	5000.00	.001	7	28.87
5.00	10000.00	.000	7	31.24
5.00	25000.00	.000	8	33.64
10.00	20.00	.333	2	14.28
10.00	50.00	.167	3	20.99
10.00	100.00	.091	4	27.40
10.00	500.00	.020	5	38.28
10.00	1000.00	.010	5	43.45
10.00	5000.00	.002	6	54.77
10.00	10000.00	.001	7	57.74
10.00	25000.00	.000	7	64.84
15.00	20.00	.429	2	17.66
15.00	50.00	.231	3	28.15
15.00	100.00	.130	3	34.81
15.00	500.00	.029	5	54.83
15.00	1000.00	.015	5	60.00
15.00	5000.00	.003	6	76.28
15.00	10000.00	.001	7	84.24
15.00	25000.00	.001	7	91.34
20.00	20.00	.500	2	21.04
20.00	50.00	.286	2	32.32
20.00	100.00	.167	3	41.98
20.00	500.00	.038	4	66.78
20.00	1000.00	.020	5	76.55
20.00	5000.00	.004	6	97.79
20.00	10000.00	.002	6	109.53
20.00	25000.00	.001	7	117.85
30.00	20.00	.600	1	23.13
30.00	50.00	.375	2	39.07
30.00	100.00	.231	3	56.31
30.00	500.00	.057	4	90.18
30.00	1000.00	.029	5	109.66
30.00	5000.00	.006	6	140.81
30.00	10000.00	.003	6	152.56
30.00	25000.00	.001	7	170.85
50.00	20.00	.714	1	26.79
50.00	50.00	.500	2	52.59
50.00	100.00	.333	2	71.39
50.00	500.00	.091	4	136.98
50.00	1000.00	.048	4	156.96
50.00	5000.00	.010	5	217.26
50.00	10000.00	.005	6	238.60
50.00	25000.00	.002	6	273.83
100.00	20.00	.833	0	34.00
100.00	50.00	.667	1	62.40
100.00	100.00	.500	2	105.19
100.00	500.00	.167	3	209.89
100.00	1000.00	.091	4	273.96
100.00	5000.00	.020	5	382.77
100.00	10000.00	.010	5	434.51
100.00	25000.00	.004	6	488.95

MEAN DEMAND VALUE PER P.L.T. EQUALS 1.8

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	4	5.50
2.00	50.00	.038	4	7.00
2.00	100.00	.020	5	7.79
2.00	500.00	.004	6	10.04
2.00	1000.00	.002	7	11.10
2.00	5000.00	.000	8	13.06
2.00	10000.00	.000	8	13.73
2.00	25000.00	.000	9	14.98
5.00	20.00	.200	3	9.97
5.00	50.00	.091	4	13.75
5.00	100.00	.048	4	16.26
5.00	500.00	.010	6	22.65
5.00	1000.00	.005	6	24.28
5.00	5000.00	.001	7	29.48
5.00	10000.00	.000	8	32.33
5.00	25000.00	.000	8	34.32
10.00	20.00	.333	2	14.84
10.00	50.00	.167	3	21.53
10.00	100.00	.091	4	27.51
10.00	500.00	.020	5	38.96
10.00	1000.00	.010	6	45.30
10.00	5000.00	.002	7	55.48
10.00	10000.00	.001	7	58.95
10.00	25000.00	.000	8	65.32
15.00	20.00	.429	2	17.98
15.00	50.00	.231	3	28.32
15.00	100.00	.130	3	36.26
15.00	500.00	.029	5	55.03
15.00	1000.00	.015	5	61.85
15.00	5000.00	.003	6	79.37
15.00	10000.00	.001	7	84.95
15.00	25000.00	.001	7	95.37
20.00	20.00	.500	2	21.13
20.00	50.00	.286	2	33.97
20.00	100.00	.167	3	43.05
20.00	500.00	.038	4	70.03
20.00	1000.00	.020	5	77.91
20.00	5000.00	.004	6	100.38
20.00	10000.00	.002	7	110.96
20.00	25000.00	.001	7	121.37
30.00	20.00	.600	1	24.26
30.00	50.00	.375	2	40.25
30.00	100.00	.231	3	56.64
30.00	500.00	.057	4	92.53
30.00	1000.00	.029	5	110.05
30.00	5000.00	.006	6	142.42
30.00	10000.00	.003	6	158.74
30.00	25000.00	.001	7	173.38
50.00	20.00	.714	1	27.57
50.00	50.00	.500	2	52.81
50.00	100.00	.333	2	74.22
50.00	500.00	.091	4	137.53
50.00	1000.00	.048	4	162.55
50.00	5000.00	.010	6	226.48
50.00	10000.00	.005	6	242.80
50.00	25000.00	.002	7	277.39
100.00	20.00	.833	1	35.84
100.00	50.00	.667	1	64.79
100.00	100.00	.500	2	105.63
100.00	500.00	.167	3	215.25
100.00	1000.00	.091	4	275.05
100.00	5000.00	.020	5	389.57
100.00	10000.00	.010	6	452.96
100.00	25000.00	.004	6	501.92

MEAN DEMAND VALUE PER P.L.T. EQUALS 1.9

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	4	5.56
2.00	50.00	.038	5	7.12
2.00	100.00	.020	5	8.00
2.00	500.00	.004	6	10.43
2.00	1000.00	.002	7	11.20
2.00	5000.00	.000	8	13.20
2.00	10000.00	.000	8	14.20
2.00	25000.00	.000	9	15.11
5.00	20.00	.200	3	10.18
5.00	50.00	.091	4	13.90
5.00	100.00	.048	4	16.98
5.00	500.00	.010	6	22.74
5.00	1000.00	.005	6	24.96
5.00	5000.00	.001	7	30.47
5.00	10000.00	.000	8	32.50
5.00	25000.00	.000	8	35.50
10.00	20.00	.333	2	15.50
10.00	50.00	.167	3	22.22
10.00	100.00	.091	4	27.79
10.00	500.00	.020	5	40.01
10.00	1000.00	.010	6	45.48
10.00	5000.00	.002	7	55.98
10.00	10000.00	.001	7	60.94
10.00	25000.00	.000	8	66.00
15.00	20.00	.429	2	18.42
15.00	50.00	.231	3	28.66
15.00	100.00	.130	3	38.01
15.00	500.00	.029	5	55.59
15.00	1000.00	.015	5	64.42
15.00	5000.00	.003	7	81.48
15.00	10000.00	.001	7	86.45
15.00	25000.00	.001	8	96.50
20.00	20.00	.500	2	21.33
20.00	50.00	.286	3	35.09
20.00	100.00	.167	3	44.44
20.00	500.00	.038	5	71.18
20.00	1000.00	.020	5	80.01
20.00	5000.00	.004	6	104.29
20.00	10000.00	.002	7	111.95
20.00	25000.00	.001	7	126.86
30.00	20.00	.600	1	25.48
30.00	50.00	.375	2	41.67
30.00	100.00	.231	3	57.31
30.00	500.00	.057	4	95.72
30.00	1000.00	.029	5	111.19
30.00	5000.00	.006	6	145.33
30.00	10000.00	.003	7	162.96
30.00	25000.00	.001	7	177.87
50.00	20.00	.714	1	28.47
50.00	50.00	.500	2	53.33
50.00	100.00	.333	2	77.50
50.00	500.00	.091	4	138.96
50.00	1000.00	.048	4	169.83
50.00	5000.00	.010	6	227.42
50.00	10000.00	.005	6	249.62
50.00	25000.00	.002	7	279.89
100.00	20.00	.833	1	35.95
100.00	50.00	.667	1	67.44
100.00	100.00	.500	2	106.66
100.00	500.00	.167	3	222.22
100.00	1000.00	.091	4	277.91
100.00	5000.00	.020	5	400.06
100.00	10000.00	.010	6	454.84
100.00	25000.00	.004	6	521.43

MEAN DEMAND VALUE PER P.L.T. EQUALS 2.0

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	4	5.65
2.00	50.00	.038	5	7.17
2.00	100.00	.020	5	8.29
2.00	500.00	.004	7	10.70
2.00	1000.00	.002	7	11.39
2.00	5000.00	.000	8	13.47
2.00	10000.00	.000	9	14.56
2.00	25000.00	.000	9	15.41
5.00	20.00	.200	3	10.45
5.00	50.00	.091	4	14.13
5.00	100.00	.048	5	17.36
5.00	500.00	.010	6	22.99
5.00	1000.00	.005	6	25.95
5.00	5000.00	.001	8	31.47
5.00	10000.00	.000	8	32.94
5.00	25000.00	.000	9	36.41
10.00	20.00	.333	2	16.24
10.00	50.00	.167	3	23.08
10.00	100.00	.091	4	28.27
10.00	500.00	.020	5	41.47
10.00	1000.00	.010	6	45.98
10.00	5000.00	.002	7	56.97
10.00	10000.00	.001	8	62.94
10.00	25000.00	.000	8	67.35
15.00	20.00	.429	2	18.95
15.00	50.00	.231	3	29.17
15.00	100.00	.130	4	38.64
15.00	500.00	.029	5	56.58
15.00	1000.00	.015	6	66.01
15.00	5000.00	.003	7	81.97
15.00	10000.00	.001	7	88.93
15.00	25000.00	.001	8	97.35
20.00	20.00	.500	2	21.65
20.00	50.00	.286	3	35.26
20.00	100.00	.167	3	46.16
20.00	500.00	.038	5	71.69
20.00	1000.00	.020	5	82.94
20.00	5000.00	.004	7	106.98
20.00	10000.00	.002	7	113.93
20.00	25000.00	.001	8	127.35
30.00	20.00	.600	1	26.77
30.00	50.00	.375	2	43.31
30.00	100.00	.231	3	58.34
30.00	500.00	.057	4	99.82
30.00	1000.00	.029	5	113.16
30.00	5000.00	.006	6	149.80
30.00	10000.00	.003	7	163.95
30.00	25000.00	.001	7	184.81
50.00	20.00	.714	1	29.47
50.00	50.00	.500	2	54.13
50.00	100.00	.333	2	81.20
50.00	500.00	.091	4	141.33
50.00	1000.00	.048	5	173.61
50.00	5000.00	.010	6	229.92
50.00	10000.00	.005	6	259.54
50.00	25000.00	.002	7	284.83
100.00	20.00	.833	1	36.24
100.00	50.00	.667	1	70.30
100.00	100.00	.500	2	108.27
100.00	500.00	.167	3	230.81
100.00	1000.00	.091	4	282.66
100.00	5000.00	.020	5	414.69
100.00	10000.00	.010	6	459.84
100.00	25000.00	.004	7	534.90

MEAN DEMAND VALUE PER P.L.T. EQUALS 2.1

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	4	5.79
2.00	50.00	.038	5	7.27
2.00	100.00	.020	6	8.59
2.00	500.00	.004	7	10.76
2.00	1000.00	.002	7	11.71
2.00	5000.00	.000	8	13.91
2.00	10000.00	.000	9	14.65
2.00	25000.00	.000	9	15.92
5.00	20.00	.200	3	10.79
5.00	50.00	.091	4	14.47
5.00	100.00	.048	5	17.46
5.00	500.00	.010	6	23.42
5.00	1000.00	.005	7	26.42
5.00	5000.00	.001	8	31.61
5.00	10000.00	.000	8	33.72
5.00	25000.00	.000	9	36.62
10.00	20.00	.333	3	16.55
10.00	50.00	.167	3	24.10
10.00	100.00	.091	4	28.94
10.00	500.00	.020	6	42.96
10.00	1000.00	.010	6	46.85
10.00	5000.00	.002	7	58.56
10.00	10000.00	.001	8	63.23
10.00	25000.00	.000	8	69.56
15.00	20.00	.429	2	19.57
15.00	50.00	.231	3	29.86
15.00	100.00	.130	4	38.89
15.00	500.00	.029	5	58.03
15.00	1000.00	.015	6	66.39
15.00	5000.00	.003	7	83.07
15.00	10000.00	.001	7	92.61
15.00	25000.00	.001	8	99.06
20.00	20.00	.500	2	22.08
20.00	50.00	.286	3	35.62
20.00	100.00	.167	3	48.20
20.00	500.00	.038	5	72.67
20.00	1000.00	.020	6	85.93
20.00	5000.00	.004	7	107.58
20.00	10000.00	.002	7	117.12
20.00	25000.00	.001	8	128.56
30.00	20.00	.600	2	27.10
30.00	50.00	.375	2	45.17
30.00	100.00	.231	3	59.72
30.00	500.00	.057	5	101.96
30.00	1000.00	.029	5	116.07
30.00	5000.00	.006	6	156.08
30.00	10000.00	.003	7	166.14
30.00	25000.00	.001	8	187.57
50.00	20.00	.714	1	30.57
50.00	50.00	.500	2	55.21
50.00	100.00	.333	3	82.76
50.00	500.00	.091	4	144.69
50.00	1000.00	.048	5	174.63
50.00	5000.00	.010	6	234.24
50.00	10000.00	.005	7	264.18
50.00	25000.00	.002	7	292.80
100.00	20.00	.833	1	36.69
100.00	50.00	.667	1	73.37
100.00	100.00	.500	2	110.41
100.00	500.00	.167	3	241.02
100.00	1000.00	.091	4	289.38
100.00	5000.00	.020	6	429.63
100.00	10000.00	.010	6	468.48
100.00	25000.00	.004	7	537.90

MEAN DEMAND VALUE PER P.L.T. EQUALS 2.2

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	4	5.96
2.00	50.00	.038	5	7.42
2.00	100.00	.020	6	8.62
2.00	500.00	.004	7	10.89
2.00	1000.00	.002	7	12.18
2.00	5000.00	.000	9	14.23
2.00	10000.00	.000	9	14.85
2.00	25000.00	.000	10	16.20
5.00	20.00	.200	3	11.20
5.00	50.00	.091	4	14.91
5.00	100.00	.048	5	17.67
5.00	500.00	.010	6	24.07
5.00	1000.00	.005	7	26.58
5.00	5000.00	.001	8	31.98
5.00	10000.00	.000	8	34.95
5.00	25000.00	.000	9	37.12
10.00	20.00	.333	3	16.64
10.00	50.00	.167	4	24.45
10.00	100.00	.091	4	29.82
10.00	500.00	.020	6	43.12
10.00	1000.00	.010	6	48.13
10.00	5000.00	.002	7	60.89
10.00	10000.00	.001	8	63.95
10.00	25000.00	.000	9	71.13
15.00	20.00	.429	2	20.29
15.00	50.00	.231	3	30.73
15.00	100.00	.130	4	39.36
15.00	500.00	.029	5	60.00
15.00	1000.00	.015	6	67.18
15.00	5000.00	.003	7	84.90
15.00	10000.00	.001	8	92.95
15.00	25000.00	.001	8	101.87
20.00	20.00	.500	2	22.61
20.00	50.00	.286	3	36.17
20.00	100.00	.167	4	48.89
20.00	500.00	.038	5	74.17
20.00	1000.00	.020	6	86.23
20.00	5000.00	.004	7	108.91
20.00	10000.00	.002	7	121.77
20.00	25000.00	.001	8	130.87
30.00	20.00	.600	2	27.27
30.00	50.00	.375	3	47.05
30.00	100.00	.231	3	61.45
30.00	500.00	.057	5	102.52
30.00	1000.00	.029	5	119.99
30.00	5000.00	.006	7	156.94
30.00	10000.00	.003	7	169.80
30.00	25000.00	.001	8	188.88
50.00	20.00	.714	1	31.76
50.00	50.00	.500	2	56.54
50.00	100.00	.333	3	83.21
50.00	500.00	.091	4	149.09
50.00	1000.00	.048	5	176.69
50.00	5000.00	.010	6	240.67
50.00	10000.00	.005	7	265.85
50.00	25000.00	.002	7	304.43
100.00	20.00	.833	1	37.30
100.00	50.00	.667	1	76.62
100.00	100.00	.500	2	113.07
100.00	500.00	.167	4	244.46
100.00	1000.00	.091	4	298.18
100.00	5000.00	.020	6	431.17
100.00	10000.00	.010	6	481.34
100.00	25000.00	.004	7	544.56

MEAN DEMAND VALUE PER P.L.T. EQUALS 2.3

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	4	6.18
2.00	50.00	.038	5	7.62
2.00	100.00	.020	6	8.70
2.00	500.00	.004	7	11.11
2.00	1000.00	.002	8	12.22
2.00	5000.00	.000	9	14.30
2.00	10000.00	.000	9	15.20
2.00	25000.00	.000	10	16.30
5.00	20.00	.200	4	11.66
5.00	50.00	.091	4	15.46
5.00	100.00	.048	5	17.99
5.00	500.00	.010	6	24.95
5.00	1000.00	.005	7	26.93
5.00	5000.00	.001	8	32.61
5.00	10000.00	.000	9	35.30
5.00	25000.00	.000	9	38.00
10.00	20.00	.333	3	16.81
10.00	50.00	.167	4	24.59
10.00	100.00	.091	4	30.91
10.00	500.00	.020	6	43.51
10.00	1000.00	.010	6	49.90
10.00	5000.00	.002	8	61.12
10.00	10000.00	.001	8	65.23
10.00	25000.00	.000	9	71.51
15.00	20.00	.429	2	21.09
15.00	50.00	.231	3	31.76
15.00	100.00	.130	4	40.05
15.00	500.00	.029	6	62.08
15.00	1000.00	.015	6	68.46
15.00	5000.00	.003	7	87.60
15.00	10000.00	.001	8	93.73
15.00	25000.00	.001	9	105.01
20.00	20.00	.500	2	23.24
20.00	50.00	.286	3	36.90
20.00	100.00	.167	4	49.18
20.00	500.00	.038	5	76.23
20.00	1000.00	.020	6	87.03
20.00	5000.00	.004	7	111.12
20.00	10000.00	.002	8	122.23
20.00	25000.00	.001	8	134.56
30.00	20.00	.600	2	27.56
30.00	50.00	.375	3	47.17
30.00	100.00	.231	3	63.53
30.00	500.00	.057	5	103.66
30.00	1000.00	.029	6	124.16
30.00	5000.00	.006	7	158.16
30.00	10000.00	.003	7	175.21
30.00	25000.00	.001	8	191.57
50.00	20.00	.714	1	33.02
50.00	50.00	.500	2	58.11
50.00	100.00	.333	3	84.07
50.00	500.00	.091	4	154.57
50.00	1000.00	.048	5	179.89
50.00	5000.00	.010	6	249.50
50.00	10000.00	.005	7	269.28
50.00	25000.00	.002	8	305.58
100.00	20.00	.833	1	38.03
100.00	50.00	.667	2	79.67
100.00	100.00	.500	2	116.22
100.00	500.00	.167	4	245.90
100.00	1000.00	.091	4	309.15
100.00	5000.00	.020	6	435.14
100.00	10000.00	.010	6	499.00
100.00	25000.00	.004	7	555.61

MEAN DEMAND VALUE PER P.L.T. EQUALS 2.4

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	5	6.34
2.00	50.00	.038	5	7.89
2.00	100.00	.020	6	8.84
2.00	500.00	.004	7	11.44
2.00	1000.00	.002	8	12.32
2.00	5000.00	.000	9	14.47
2.00	10000.00	.000	10	15.73
2.00	25000.00	.000	10	16.53
5.00	20.00	.200	4	11.69
5.00	50.00	.091	5	15.84
5.00	100.00	.048	5	18.43
5.00	500.00	.010	7	25.25
5.00	1000.00	.005	7	27.48
5.00	5000.00	.001	8	33.59
5.00	10000.00	.000	9	35.55
5.00	25000.00	.000	10	39.33
10.00	20.00	.333	3	17.07
10.00	50.00	.167	4	24.86
10.00	100.00	.091	5	31.69
10.00	500.00	.020	6	44.19
10.00	1000.00	.010	7	50.50
10.00	5000.00	.002	8	61.60
10.00	10000.00	.001	8	67.18
10.00	25000.00	.000	9	72.37
15.00	20.00	.429	3	21.91
15.00	50.00	.231	3	32.98
15.00	100.00	.130	4	40.97
15.00	500.00	.029	6	62.27
15.00	1000.00	.015	6	70.29
15.00	5000.00	.003	8	89.60
15.00	10000.00	.001	8	95.19
15.00	25000.00	.001	9	105.38
20.00	20.00	.500	2	23.97
20.00	50.00	.286	3	37.82
20.00	100.00	.167	4	49.71
20.00	500.00	.038	5	78.90
20.00	1000.00	.020	6	88.37
20.00	5000.00	.004	7	114.37
20.00	10000.00	.002	8	123.19
20.00	25000.00	.001	9	138.38
30.00	20.00	.600	2	27.96
30.00	50.00	.375	3	47.51
30.00	100.00	.231	3	65.95
30.00	500.00	.057	5	105.41
30.00	1000.00	.029	6	124.53
30.00	5000.00	.006	7	160.41
30.00	10000.00	.003	8	179.20
30.00	25000.00	.001	8	195.95
50.00	20.00	.714	1	34.35
50.00	50.00	.500	2	59.92
50.00	100.00	.333	3	85.33
50.00	500.00	.091	5	158.45
50.00	1000.00	.048	5	184.31
50.00	5000.00	.010	7	252.50
50.00	10000.00	.005	7	274.78
50.00	25000.00	.002	8	307.98
100.00	20.00	.833	1	38.89
100.00	50.00	.667	2	79.87
100.00	100.00	.500	2	119.83
100.00	500.00	.167	4	248.55
100.00	1000.00	.091	5	316.89
100.00	5000.00	.020	6	441.85
100.00	10000.00	.010	7	505.00
100.00	25000.00	.004	7	571.83

MEAN DEMAND VALUE PER P.L.T. EQUALS 2.5

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	5	6.36
2.00	50.00	.038	6	8.04
2.00	100.00	.020	6	9.03
2.00	500.00	.004	8	11.75
2.00	1000.00	.002	8	12.50
2.00	5000.00	.000	9	14.77
2.00	10000.00	.000	10	15.77
2.00	25000.00	.000	10	16.93
5.00	20.00	.200	4	11.77
5.00	50.00	.091	5	15.91
5.00	100.00	.048	5	19.00
5.00	500.00	.010	7	25.40
5.00	1000.00	.005	7	28.27
5.00	5000.00	.001	9	34.27
5.00	10000.00	.000	9	36.05
5.00	25000.00	.000	10	39.43
10.00	20.00	.333	3	17.40
10.00	50.00	.167	4	25.25
10.00	100.00	.091	5	31.81
10.00	500.00	.020	6	45.16
10.00	1000.00	.010	7	50.80
10.00	5000.00	.002	8	62.49
10.00	10000.00	.001	9	68.55
10.00	25000.00	.000	9	73.87
15.00	20.00	.429	3	21.96
15.00	50.00	.231	4	33.60
15.00	100.00	.130	4	42.14
15.00	500.00	.029	6	62.76
15.00	1000.00	.015	6	72.73
15.00	5000.00	.003	8	90.00
15.00	10000.00	.001	8	97.47
15.00	25000.00	.001	9	106.37
20.00	20.00	.500	2	24.78
20.00	50.00	.286	3	38.92
20.00	100.00	.167	4	50.49
20.00	500.00	.038	6	80.36
20.00	1000.00	.020	6	90.33
20.00	5000.00	.004	8	117.50
20.00	10000.00	.002	8	124.98
20.00	25000.00	.001	9	138.87
30.00	20.00	.600	2	28.47
30.00	50.00	.375	3	48.06
30.00	100.00	.231	4	67.20
30.00	500.00	.057	5	107.83
30.00	1000.00	.029	6	125.53
30.00	5000.00	.006	7	163.88
30.00	10000.00	.003	8	179.99
30.00	25000.00	.001	8	202.41
50.00	20.00	.714	1	35.75
50.00	50.00	.500	2	61.94
50.00	100.00	.333	3	86.98
50.00	500.00	.091	5	159.07
50.00	1000.00	.048	5	190.05
50.00	5000.00	.010	7	253.99
50.00	10000.00	.005	7	282.70
50.00	25000.00	.002	8	312.44
100.00	20.00	.833	1	39.85
100.00	50.00	.667	2	80.41
100.00	100.00	.500	2	123.88
100.00	500.00	.167	4	252.46
100.00	1000.00	.091	5	318.14
100.00	5000.00	.020	6	451.64
100.00	10000.00	.010	7	507.99
100.00	25000.00	.004	8	587.52

MEAN DEMAND VALUE PER P.L.T. EQUALS 2.6

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	5	6.42
2.00	50.00	.038	6	8.07
2.00	100.00	.020	6	9.30
2.00	500.00	.004	8	11.79
2.00	1000.00	.002	8	12.78
2.00	5000.00	.000	9	15.23
2.00	10000.00	.000	10	15.90
2.00	25000.00	.000	11	17.37
5.00	20.00	.200	4	11.90
5.00	50.00	.091	5	16.04
5.00	100.00	.048	6	19.57
5.00	500.00	.010	7	25.69
5.00	1000.00	.005	8	28.98
5.00	5000.00	.001	9	34.43
5.00	10000.00	.000	9	36.85
5.00	25000.00	.000	10	39.74
10.00	20.00	.333	3	17.80
10.00	50.00	.167	4	25.77
10.00	100.00	.091	5	32.09
10.00	500.00	.020	6	46.48
10.00	1000.00	.010	7	51.38
10.00	5000.00	.002	8	63.88
10.00	10000.00	.001	9	68.86
10.00	25000.00	.000	9	76.14
15.00	20.00	.429	3	22.10
15.00	50.00	.231	4	33.75
15.00	100.00	.130	4	43.55
15.00	500.00	.029	6	63.61
15.00	1000.00	.015	7	73.42
15.00	5000.00	.003	8	90.89
15.00	10000.00	.001	8	100.75
15.00	25000.00	.001	9	108.14
20.00	20.00	.500	2	25.67
20.00	50.00	.286	3	40.21
20.00	100.00	.167	4	51.53
20.00	500.00	.038	6	80.73
20.00	1000.00	.020	6	92.97
20.00	5000.00	.004	8	117.90
20.00	10000.00	.002	8	127.76
20.00	25000.00	.001	9	140.14
30.00	20.00	.600	2	29.08
30.00	50.00	.375	3	48.81
30.00	100.00	.231	4	67.49
30.00	500.00	.057	5	110.96
30.00	1000.00	.029	6	127.21
30.00	5000.00	.006	7	168.75
30.00	10000.00	.003	8	181.78
30.00	25000.00	.001	9	204.14
50.00	20.00	.714	2	35.92
50.00	50.00	.500	2	64.17
50.00	100.00	.333	3	89.01
50.00	500.00	.091	5	160.43
50.00	1000.00	.048	6	195.70
50.00	5000.00	.010	7	256.89
50.00	10000.00	.005	8	289.82
50.00	25000.00	.002	8	319.40
100.00	20.00	.833	1	40.91
100.00	50.00	.667	2	81.25
100.00	100.00	.500	2	128.33
100.00	500.00	.167	4	257.65
100.00	1000.00	.091	5	320.86
100.00	5000.00	.020	6	464.83
100.00	10000.00	.010	7	513.79
100.00	25000.00	.004	8	589.50

MEAN DEMAND VALUE PER P.L.T. EQUALS 2.7

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	5	6.50
2.00	50.00	.038	6	8.15
2.00	100.00	.020	7	9.54
2.00	500.00	.004	8	11.89
2.00	1000.00	.002	8	13.17
2.00	5000.00	.000	10	15.37
2.00	10000.00	.000	10	16.13
2.00	25000.00	.000	11	17.43
5.00	20.00	.200	4	12.09
5.00	50.00	.091	5	16.26
5.00	100.00	.048	6	19.62
5.00	500.00	.010	7	26.14
5.00	1000.00	.005	8	29.08
5.00	5000.00	.001	9	34.78
5.00	10000.00	.000	10	38.03
5.00	25000.00	.000	10	40.33
10.00	20.00	.333	3	18.28
10.00	50.00	.167	4	26.41
10.00	100.00	.091	5	32.51
10.00	500.00	.020	7	47.69
10.00	1000.00	.010	7	52.28
10.00	5000.00	.002	8	65.87
10.00	10000.00	.001	9	69.55
10.00	25000.00	.000	10	76.83
15.00	20.00	.429	3	22.33
15.00	50.00	.231	4	34.03
15.00	100.00	.130	5	44.45
15.00	500.00	.029	6	64.83
15.00	1000.00	.015	7	73.83
15.00	5000.00	.003	8	92.38
15.00	10000.00	.001	9	101.06
15.00	25000.00	.001	9	110.87
20.00	20.00	.500	3	26.38
20.00	50.00	.286	4	41.65
20.00	100.00	.167	4	52.83
20.00	500.00	.038	6	81.47
20.00	1000.00	.020	7	95.37
20.00	5000.00	.004	8	118.89
20.00	10000.00	.002	8	131.73
20.00	25000.00	.001	9	142.38
30.00	20.00	.600	2	29.79
30.00	50.00	.375	3	49.76
30.00	100.00	.231	4	68.07
30.00	500.00	.057	6	114.77
30.00	1000.00	.029	6	129.65
30.00	5000.00	.006	8	171.92
30.00	10000.00	.003	8	184.76
30.00	25000.00	.001	9	205.38
50.00	20.00	.714	2	36.11
50.00	50.00	.500	3	65.95
50.00	100.00	.333	3	91.42
50.00	500.00	.091	5	162.57
50.00	1000.00	.048	6	196.25
50.00	5000.00	.010	7	261.41
50.00	10000.00	.005	8	290.81
50.00	25000.00	.002	8	329.33
100.00	20.00	.833	1	42.06
100.00	50.00	.667	2	82.38
100.00	100.00	.500	3	131.90
100.00	500.00	.167	4	264.15
100.00	1000.00	.091	5	325.14
100.00	5000.00	.020	7	476.87
100.00	10000.00	.010	7	522.81
100.00	25000.00	.004	8	594.46

MEAN DEMAND VALUE PER P.L.T. EQUALS 2.8

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	5	6.62
2.00	50.00	.038	6	8.26
2.00	100.00	.020	7	9.57
2.00	500.00	.004	8	12.06
2.00	1000.00	.002	9	13.27
2.00	5000.00	.000	10	15.46
2.00	10000.00	.000	10	16.51
2.00	25000.00	.000	11	17.58
5.00	20.00	.200	4	12.33
5.00	50.00	.091	5	16.55
5.00	100.00	.048	6	19.76
5.00	500.00	.010	7	26.77
5.00	1000.00	.005	8	29.32
5.00	5000.00	.001	9	35.36
5.00	10000.00	.000	10	38.11
5.00	25000.00	.000	10	41.27
10.00	20.00	.333	3	18.84
10.00	50.00	.167	4	27.20
10.00	100.00	.091	5	33.11
10.00	500.00	.020	7	47.83
10.00	1000.00	.010	7	53.55
10.00	5000.00	.002	9	66.36
10.00	10000.00	.001	9	70.72
10.00	25000.00	.000	10	77.28
15.00	20.00	.429	3	22.65
15.00	50.00	.231	4	34.46
15.00	100.00	.130	5	44.61
15.00	500.00	.029	6	66.46
15.00	1000.00	.015	7	74.61
15.00	5000.00	.003	8	94.57
15.00	10000.00	.001	9	101.72
15.00	25000.00	.001	10	113.28
20.00	20.00	.500	3	26.45
20.00	50.00	.286	4	41.73
20.00	100.00	.167	4	54.39
20.00	500.00	.038	6	82.64
20.00	1000.00	.020	7	95.66
20.00	5000.00	.004	8	120.59
20.00	10000.00	.002	9	132.73
20.00	25000.00	.001	9	145.79
30.00	20.00	.600	2	30.59
30.00	50.00	.375	3	50.91
30.00	100.00	.231	4	68.93
30.00	500.00	.057	6	115.00
30.00	1000.00	.029	6	132.92
30.00	5000.00	.006	8	172.62
30.00	10000.00	.003	8	189.14
30.00	25000.00	.001	9	207.80
50.00	20.00	.714	2	36.43
50.00	50.00	.500	3	66.13
50.00	100.00	.333	3	94.20
50.00	500.00	.091	5	165.53
50.00	1000.00	.048	6	197.64
50.00	5000.00	.010	7	267.74
50.00	10000.00	.005	8	293.20
50.00	25000.00	.002	9	331.82
100.00	20.00	.833	1	43.30
100.00	50.00	.667	2	83.78
100.00	100.00	.500	3	132.27
100.00	500.00	.167	4	271.97
100.00	1000.00	.091	5	331.05
100.00	5000.00	.020	7	478.32
100.00	10000.00	.010	7	535.49
100.00	25000.00	.004	8	602.93

MEAN DEMAND VALUE PER P.L.T. EQUALS 2.9

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	5	6.77
2.00	50.00	.038	6	8.43
2.00	100.00	.020	7	9.64
2.00	500.00	.004	8	12.31
2.00	1000.00	.002	9	13.35
2.00	5000.00	.000	10	15.63
2.00	10000.00	.000	11	16.86
2.00	25000.00	.000	11	17.86
5.00	20.00	.200	4	12.63
5.00	50.00	.091	5	16.93
5.00	100.00	.048	6	19.99
5.00	500.00	.010	7	27.61
5.00	1000.00	.005	8	29.72
5.00	5000.00	.001	9	36.23
5.00	10000.00	.000	10	38.37
5.00	25000.00	.000	11	42.16
10.00	20.00	.333	3	19.47
10.00	50.00	.167	5	28.02
10.00	100.00	.091	5	33.87
10.00	500.00	.020	7	48.18
10.00	1000.00	.010	7	55.23
10.00	5000.00	.002	9	66.73
10.00	10000.00	.001	9	72.46
10.00	25000.00	.000	10	78.16
15.00	20.00	.429	3	23.05
15.00	50.00	.231	4	35.04
15.00	100.00	.130	5	44.95
15.00	500.00	.029	6	68.54
15.00	1000.00	.015	7	75.80
15.00	5000.00	.003	9	97.24
15.00	10000.00	.001	9	102.96
15.00	25000.00	.001	10	113.67
20.00	20.00	.500	3	26.62
20.00	50.00	.286	4	41.96
20.00	100.00	.167	5	56.04
20.00	500.00	.038	6	84.26
20.00	1000.00	.020	7	96.37
20.00	5000.00	.004	8	123.10
20.00	10000.00	.002	9	133.47
20.00	25000.00	.001	10	149.17
30.00	20.00	.600	2	31.48
30.00	50.00	.375	3	52.25
30.00	100.00	.231	4	70.08
30.00	500.00	.057	6	115.69
30.00	1000.00	.029	6	137.09
30.00	5000.00	.006	8	174.14
30.00	10000.00	.003	9	194.48
30.00	25000.00	.001	9	211.65
50.00	20.00	.714	2	36.87
50.00	50.00	.500	3	66.56
50.00	100.00	.333	3	97.34
50.00	500.00	.091	5	169.34
50.00	1000.00	.048	6	199.94
50.00	5000.00	.010	7	276.14
50.00	10000.00	.005	8	297.23
50.00	25000.00	.002	9	333.67
100.00	20.00	.833	1	44.60
100.00	50.00	.667	2	85.44
100.00	100.00	.500	3	133.12
100.00	500.00	.167	5	280.19
100.00	1000.00	.091	5	338.68
100.00	5000.00	.020	7	481.84
100.00	10000.00	.010	7	552.28
100.00	25000.00	.004	8	615.48

MEAN DEMAND VALUE PER P.L.T. EQUALS 3.0

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	5	6.96
2.00	50.00	.038	6	8.64
2.00	100.00	.020	7	9.75
2.00	500.00	.004	8	12.66
2.00	1000.00	.002	9	13.49
2.00	5000.00	.000	10	15.92
2.00	10000.00	.000	11	16.92
2.00	25000.00	.000	11	18.29
5.00	20.00	.200	4	12.98
5.00	50.00	.091	5	17.40
5.00	100.00	.048	6	20.32
5.00	500.00	.010	8	27.67
5.00	1000.00	.005	8	30.32
5.00	5000.00	.001	10	36.92
5.00	10000.00	.000	10	38.84
5.00	25000.00	.000	11	42.29
10.00	20.00	.333	4	19.58
10.00	50.00	.167	5	28.08
10.00	100.00	.091	5	34.81
10.00	500.00	.020	7	48.77
10.00	1000.00	.010	8	55.34
10.00	5000.00	.002	9	67.45
10.00	10000.00	.001	10	73.84
10.00	25000.00	.000	10	79.61
15.00	20.00	.429	3	23.52
15.00	50.00	.231	4	35.76
15.00	100.00	.130	5	45.48
15.00	500.00	.029	7	68.85
15.00	1000.00	.015	7	77.45
15.00	5000.00	.003	9	97.46
15.00	10000.00	.001	9	104.89
15.00	25000.00	.001	10	114.61
20.00	20.00	.500	3	26.89
20.00	50.00	.286	4	42.36
20.00	100.00	.167	5	56.15
20.00	500.00	.038	6	86.37
20.00	1000.00	.020	7	97.54
20.00	5000.00	.004	8	126.55
20.00	10000.00	.002	9	134.90
20.00	25000.00	.001	10	149.61
30.00	20.00	.600	2	32.45
30.00	50.00	.375	3	53.77
30.00	100.00	.231	4	71.52
30.00	500.00	.057	6	116.87
30.00	1000.00	.029	7	137.71
30.00	5000.00	.006	8	176.61
30.00	10000.00	.003	9	194.91
30.00	25000.00	.001	9	217.21
50.00	20.00	.714	2	37.43
50.00	50.00	.500	3	67.21
50.00	100.00	.333	4	97.90
50.00	500.00	.091	5	174.04
50.00	1000.00	.048	6	203.24
50.00	5000.00	.010	8	276.71
50.00	10000.00	.005	8	303.16
50.00	25000.00	.002	9	337.24
100.00	20.00	.833	1	45.97
100.00	50.00	.667	2	87.34
100.00	100.00	.500	3	134.43
100.00	500.00	.167	5	280.77
100.00	1000.00	.091	5	348.08
100.00	5000.00	.020	7	487.69
100.00	10000.00	.010	8	553.42
100.00	25000.00	.004	8	632.77

MEAN DEMAND VALUE PER P.L.T. EQUALS 3.1

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	6	7.11
2.00	50.00	.038	7	8.88
2.00	100.00	.020	7	9.92
2.00	500.00	.004	9	12.76
2.00	1000.00	.002	9	13.71
2.00	5000.00	.000	10	16.34
2.00	10000.00	.000	11	17.05
2.00	25000.00	.000	12	18.52
5.00	20.00	.200	5	13.35
5.00	50.00	.091	6	17.78
5.00	100.00	.048	6	20.76
5.00	500.00	.010	8	27.83
5.00	1000.00	.005	8	31.13
5.00	5000.00	.001	10	37.05
5.00	10000.00	.000	10	39.59
5.00	25000.00	.000	11	42.63
10.00	20.00	.333	4	19.67
10.00	50.00	.167	5	28.24
10.00	100.00	.091	6	35.56
10.00	500.00	.020	7	49.61
10.00	1000.00	.010	8	55.66
10.00	5000.00	.002	9	68.57
10.00	10000.00	.001	10	74.09
10.00	25000.00	.000	10	81.72
15.00	20.00	.429	3	24.08
15.00	50.00	.231	4	36.62
15.00	100.00	.130	5	46.20
15.00	500.00	.029	7	69.21
15.00	1000.00	.015	7	79.62
15.00	5000.00	.003	9	98.08
15.00	10000.00	.001	9	107.63
15.00	25000.00	.001	10	116.23
20.00	20.00	.500	3	27.24
20.00	50.00	.286	4	42.90
20.00	100.00	.167	5	56.47
20.00	500.00	.038	7	88.82
20.00	1000.00	.020	7	99.22
20.00	5000.00	.004	9	127.59
20.00	10000.00	.002	9	137.14
20.00	25000.00	.001	10	150.73
30.00	20.00	.600	2	33.49
30.00	50.00	.375	4	55.46
30.00	100.00	.231	4	73.25
30.00	500.00	.057	6	118.59
30.00	1000.00	.029	7	138.43
30.00	5000.00	.006	8	180.16
30.00	10000.00	.003	9	196.15
30.00	25000.00	.001	10	219.73
50.00	20.00	.714	2	38.08
50.00	50.00	.500	3	68.09
50.00	100.00	.333	4	98.36
50.00	500.00	.091	6	177.79
50.00	1000.00	.048	6	207.59
50.00	5000.00	.010	8	278.29
50.00	10000.00	.005	8	311.26
50.00	25000.00	.002	9	342.84
100.00	20.00	.833	1	47.41
100.00	50.00	.667	2	89.46
100.00	100.00	.500	3	136.18
100.00	500.00	.167	5	282.37
100.00	1000.00	.091	6	355.57
100.00	5000.00	.020	7	496.11
100.00	10000.00	.010	8	556.59
100.00	25000.00	.004	9	637.93

MEAN DEMAND VALUE PER P.L.T. EQUALS 3.2

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	6	7.13
2.00	50.00	.038	7	8.90
2.00	100.00	.020	7	10.15
2.00	500.00	.004	9	12.82
2.00	1000.00	.002	9	14.03
2.00	5000.00	.000	11	16.45
2.00	10000.00	.000	11	17.29
2.00	25000.00	.000	12	18.60
5.00	20.00	.200	5	13.37
5.00	50.00	.091	6	17.83
5.00	100.00	.048	6	21.31
5.00	500.00	.010	8	28.11
5.00	1000.00	.005	9	31.44
5.00	5000.00	.001	10	37.34
5.00	10000.00	.000	10	40.67
5.00	25000.00	.000	11	43.23
10.00	20.00	.333	4	19.83
10.00	50.00	.167	5	28.50
10.00	100.00	.091	6	35.66
10.00	500.00	.020	7	50.74
10.00	1000.00	.010	8	56.22
10.00	5000.00	.002	9	70.17
10.00	10000.00	.001	10	74.67
10.00	25000.00	.000	11	82.23
15.00	20.00	.429	3	24.72
15.00	50.00	.231	4	37.64
15.00	100.00	.130	5	47.12
15.00	500.00	.029	7	69.86
15.00	1000.00	.015	8	80.26
15.00	5000.00	.003	9	99.18
15.00	10000.00	.001	10	108.67
15.00	25000.00	.001	10	118.67
20.00	20.00	.500	3	27.67
20.00	50.00	.286	4	43.61
20.00	100.00	.167	5	57.00
20.00	500.00	.038	7	88.99
20.00	1000.00	.020	7	101.47
20.00	5000.00	.004	9	128.19
20.00	10000.00	.002	9	140.33
20.00	25000.00	.001	10	152.67
30.00	20.00	.600	3	33.59
30.00	50.00	.375	4	55.55
30.00	100.00	.231	4	75.27
30.00	500.00	.057	6	120.88
30.00	1000.00	.029	7	139.72
30.00	5000.00	.006	8	184.96
30.00	10000.00	.003	9	198.36
30.00	25000.00	.001	10	220.68
50.00	20.00	.714	2	38.84
50.00	50.00	.500	3	69.19
50.00	100.00	.333	4	99.16
50.00	500.00	.091	6	178.28
50.00	1000.00	.048	6	213.07
50.00	5000.00	.010	8	281.12
50.00	10000.00	.005	9	314.40
50.00	25000.00	.002	9	350.83
100.00	20.00	.833	1	48.89
100.00	50.00	.667	2	91.79
100.00	100.00	.500	3	138.37
100.00	500.00	.167	5	285.00
100.00	1000.00	.091	6	356.55
100.00	5000.00	.020	7	507.36
100.00	10000.00	.010	8	562.24
100.00	25000.00	.004	9	640.95

MEAN DEMAND VALUE PER P.L.T. EQUALS 3.3

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	6	7.18
2.00	50.00	.038	7	8.95
2.00	100.00	.020	8	10.42
2.00	500.00	.004	9	12.94
2.00	1000.00	.002	10	14.27
2.00	5000.00	.000	11	16.53
2.00	10000.00	.000	11	17.66
2.00	25000.00	.000	12	18.77
5.00	20.00	.200	5	13.45
5.00	50.00	.091	6	17.94
5.00	100.00	.048	7	21.62
5.00	500.00	.010	8	28.53
5.00	1000.00	.005	9	31.57
5.00	5000.00	.001	10	37.82
5.00	10000.00	.000	11	40.76
5.00	25000.00	.000	11	44.14
10.00	20.00	.333	4	20.06
10.00	50.00	.167	5	28.87
10.00	100.00	.091	6	35.88
10.00	500.00	.020	8	52.08
10.00	1000.00	.010	8	57.07
10.00	5000.00	.002	10	71.33
10.00	10000.00	.001	10	75.64
10.00	25000.00	.000	11	82.64
15.00	20.00	.429	3	25.42
15.00	50.00	.231	5	38.36
15.00	100.00	.130	5	48.25
15.00	500.00	.029	7	70.82
15.00	1000.00	.015	8	80.62
15.00	5000.00	.003	9	100.84
15.00	10000.00	.001	10	109.15
15.00	25000.00	.001	11	121.15
20.00	20.00	.500	3	28.20
20.00	50.00	.286	4	44.47
20.00	100.00	.167	5	57.74
20.00	500.00	.038	7	89.47
20.00	1000.00	.020	8	104.17
20.00	5000.00	.004	9	129.35
20.00	10000.00	.002	10	142.65
20.00	25000.00	.001	10	155.61
30.00	20.00	.600	3	33.75
30.00	50.00	.375	4	55.82
30.00	100.00	.231	5	76.72
30.00	500.00	.057	6	123.78
30.00	1000.00	.029	7	141.64
30.00	5000.00	.006	9	186.38
30.00	10000.00	.003	9	201.67
30.00	25000.00	.001	10	222.61
50.00	20.00	.714	2	39.68
50.00	50.00	.500	3	70.49
50.00	100.00	.333	4	100.29
50.00	500.00	.091	6	179.39
50.00	1000.00	.048	7	216.23
50.00	5000.00	.010	8	285.35
50.00	10000.00	.005	9	315.73
50.00	25000.00	.002	10	356.63
100.00	20.00	.833	2	49.46
100.00	50.00	.667	2	94.32
100.00	100.00	.500	3	140.98
100.00	500.00	.167	5	288.70
100.00	1000.00	.091	6	358.78
100.00	5000.00	.020	8	520.85
100.00	10000.00	.010	8	570.70
100.00	25000.00	.004	9	646.76

MEAN DEMAND VALUE PER P.L.T. EQUALS 3.4

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	6	7.25
2.00	50.00	.038	7	9.03
2.00	100.00	.020	8	10.44
2.00	500.00	.004	9	13.12
2.00	1000.00	.002	10	14.31
2.00	5000.00	.000	11	16.69
2.00	10000.00	.000	12	17.94
2.00	25000.00	.000	12	19.06
5.00	20.00	.200	5	13.56
5.00	50.00	.091	6	18.12
5.00	100.00	.048	7	21.69
5.00	500.00	.010	8	29.12
5.00	1000.00	.005	9	31.84
5.00	5000.00	.001	10	38.55
5.00	10000.00	.000	11	40.98
5.00	25000.00	.000	12	44.86
10.00	20.00	.333	4	20.35
10.00	50.00	.167	5	29.35
10.00	100.00	.091	6	36.23
10.00	500.00	.020	8	52.18
10.00	1000.00	.010	8	58.23
10.00	5000.00	.002	10	71.55
10.00	10000.00	.001	10	77.09
10.00	25000.00	.000	11	83.45
15.00	20.00	.429	4	25.74
15.00	50.00	.231	5	38.46
15.00	100.00	.130	5	49.59
15.00	500.00	.029	7	72.12
15.00	1000.00	.015	8	81.29
15.00	5000.00	.003	9	103.14
15.00	10000.00	.001	10	110.10
15.00	25000.00	.001	11	121.45
20.00	20.00	.500	3	28.80
20.00	50.00	.286	4	45.48
20.00	100.00	.167	5	58.70
20.00	500.00	.038	7	90.30
20.00	1000.00	.020	8	104.35
20.00	5000.00	.004	9	131.16
20.00	10000.00	.002	10	143.10
20.00	25000.00	.001	11	159.45
30.00	20.00	.600	3	34.00
30.00	50.00	.375	4	56.27
30.00	100.00	.231	5	76.92
30.00	500.00	.057	7	126.65
30.00	1000.00	.029	7	144.24
30.00	5000.00	.006	9	187.20
30.00	10000.00	.003	9	206.28
30.00	25000.00	.001	10	225.73
50.00	20.00	.714	2	40.62
50.00	50.00	.500	3	72.00
50.00	100.00	.333	4	101.75
50.00	500.00	.091	6	181.17
50.00	1000.00	.048	7	216.94
50.00	5000.00	.010	8	291.15
50.00	10000.00	.005	9	318.36
50.00	25000.00	.002	10	357.76
100.00	20.00	.833	2	49.63
100.00	50.00	.667	2	97.03
100.00	100.00	.500	3	143.99
100.00	500.00	.167	5	293.50
100.00	1000.00	.091	6	362.34
100.00	5000.00	.020	8	521.76
100.00	10000.00	.010	8	582.31
100.00	25000.00	.004	9	655.80

MEAN DEMAND VALUE PER P.L.T. EQUALS 3.5

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	6	7.35
2.00	50.00	.038	7	9.15
2.00	100.00	.020	8	10.49
2.00	500.00	.004	9	13.37
2.00	1000.00	.002	10	14.41
2.00	5000.00	.000	11	16.95
2.00	10000.00	.000	12	18.00
2.00	25000.00	.000	12	19.50
5.00	20.00	.200	5	13.73
5.00	50.00	.091	6	18.36
5.00	100.00	.048	7	21.84
5.00	500.00	.010	8	29.87
5.00	1000.00	.005	9	32.25
5.00	5000.00	.001	11	39.45
5.00	10000.00	.000	11	41.39
5.00	25000.00	.000	12	45.00
10.00	20.00	.333	4	20.71
10.00	50.00	.167	5	29.94
10.00	100.00	.091	6	36.73
10.00	500.00	.020	8	52.44
10.00	1000.00	.010	8	59.74
10.00	5000.00	.002	10	72.06
10.00	10000.00	.001	11	78.89
10.00	25000.00	.000	11	84.73
15.00	20.00	.429	4	25.82
15.00	50.00	.231	5	38.69
15.00	100.00	.130	6	49.76
15.00	500.00	.029	7	73.79
15.00	1000.00	.015	8	82.32
15.00	5000.00	.003	10	104.56
15.00	10000.00	.001	10	111.60
15.00	25000.00	.001	11	122.23
20.00	20.00	.500	3	29.48
20.00	50.00	.286	4	46.65
20.00	100.00	.167	5	59.88
20.00	500.00	.038	7	91.49
20.00	1000.00	.020	8	104.89
20.00	5000.00	.004	9	133.71
20.00	10000.00	.002	10	144.11
20.00	25000.00	.001	11	159.73
30.00	20.00	.600	3	34.35
30.00	50.00	.375	4	56.89
30.00	100.00	.231	5	77.37
30.00	500.00	.057	7	126.91
30.00	1000.00	.029	7	147.58
30.00	5000.00	.006	9	188.76
30.00	10000.00	.003	10	209.13
30.00	25000.00	.001	10	230.25
50.00	20.00	.714	2	41.63
50.00	50.00	.500	3	73.69
50.00	100.00	.333	4	103.53
50.00	500.00	.091	6	183.64
50.00	1000.00	.048	7	218.40
50.00	5000.00	.010	8	298.71
50.00	10000.00	.005	9	322.47
50.00	25000.00	.002	10	360.28
100.00	20.00	.833	2	49.93
100.00	50.00	.667	3	98.04
100.00	100.00	.500	3	147.39
100.00	500.00	.167	5	299.41
100.00	1000.00	.091	6	367.29
100.00	5000.00	.020	8	524.44
100.00	10000.00	.010	8	597.43
100.00	25000.00	.004	9	668.55

MEAN DEMAND VALUE PER P.L.T. EQUALS 3.6

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	6	7.47
2.00	50.00	.038	7	9.31
2.00	100.00	.020	8	10.58
2.00	500.00	.004	10	13.69
2.00	1000.00	.002	10	14.58
2.00	5000.00	.000	11	17.32
2.00	10000.00	.000	12	18.13
2.00	25000.00	.000	13	19.62
5.00	20.00	.200	5	13.94
5.00	50.00	.091	6	18.68
5.00	100.00	.048	7	22.07
5.00	500.00	.010	9	29.93
5.00	1000.00	.005	9	32.83
5.00	5000.00	.001	11	39.52
5.00	10000.00	.000	11	42.03
5.00	25000.00	.000	12	45.32
10.00	20.00	.333	4	21.13
10.00	50.00	.167	5	30.64
10.00	100.00	.091	6	37.37
10.00	500.00	.020	8	52.91
10.00	1000.00	.010	9	59.86
10.00	5000.00	.002	10	72.89
10.00	10000.00	.001	11	79.04
10.00	25000.00	.000	11	86.58
15.00	20.00	.429	4	25.98
15.00	50.00	.231	5	39.03
15.00	100.00	.130	6	49.98
15.00	500.00	.029	8	75.00
15.00	1000.00	.015	8	83.73
15.00	5000.00	.003	10	104.90
15.00	10000.00	.001	10	113.77
15.00	25000.00	.001	11	123.59
20.00	20.00	.500	3	30.23
20.00	50.00	.286	5	47.42
20.00	100.00	.167	5	61.29
20.00	500.00	.038	7	93.09
20.00	1000.00	.020	8	105.82
20.00	5000.00	.004	10	136.91
20.00	10000.00	.002	10	145.78
20.00	25000.00	.001	11	160.59
30.00	20.00	.600	3	34.79
30.00	50.00	.375	4	57.68
30.00	100.00	.231	5	78.06
30.00	500.00	.057	7	127.58
30.00	1000.00	.029	8	149.99
30.00	5000.00	.006	9	191.17
30.00	10000.00	.003	10	209.80
30.00	25000.00	.001	11	234.59
50.00	20.00	.714	2	42.71
50.00	50.00	.500	3	75.58
50.00	100.00	.333	4	105.65
50.00	500.00	.091	6	186.84
50.00	1000.00	.048	7	220.67
50.00	5000.00	.010	9	299.28
50.00	10000.00	.005	9	328.28
50.00	25000.00	.002	10	364.45
100.00	20.00	.833	2	50.36
100.00	50.00	.667	3	98.36
100.00	100.00	.500	3	151.15
100.00	500.00	.167	5	306.45
100.00	1000.00	.091	6	373.69
100.00	5000.00	.020	8	529.10
100.00	10000.00	.010	9	598.57
100.00	25000.00	.004	10	684.54

MEAN DEMAND VALUE PER P.L.T. EQUALS 3.7

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	6	7.63
2.00	50.00	.038	7	9.51
2.00	100.00	.020	8	10.72
2.00	500.00	.004	10	13.71
2.00	1000.00	.002	10	14.82
2.00	5000.00	.000	12	17.47
2.00	10000.00	.000	12	18.35
2.00	25000.00	.000	13	19.71
5.00	20.00	.200	5	14.19
5.00	50.00	.091	6	19.08
5.00	100.00	.048	7	22.38
5.00	500.00	.010	9	30.07
5.00	1000.00	.005	9	33.60
5.00	5000.00	.001	11	39.73
5.00	10000.00	.000	11	42.95
5.00	25000.00	.000	12	45.87
10.00	20.00	.333	4	21.62
10.00	50.00	.167	6	31.27
10.00	100.00	.091	6	38.16
10.00	500.00	.020	8	53.59
10.00	1000.00	.010	9	60.14
10.00	5000.00	.002	10	74.11
10.00	10000.00	.001	11	79.46
10.00	25000.00	.000	12	87.37
15.00	20.00	.429	4	26.22
15.00	50.00	.231	5	39.50
15.00	100.00	.130	6	50.35
15.00	500.00	.029	8	75.20
15.00	1000.00	.015	8	85.58
15.00	5000.00	.003	10	105.62
15.00	10000.00	.001	11	115.96
15.00	25000.00	.001	11	125.63
20.00	20.00	.500	4	30.82
20.00	50.00	.286	5	47.54
20.00	100.00	.167	6	62.54
20.00	500.00	.038	7	95.12
20.00	1000.00	.020	8	107.18
20.00	5000.00	.004	10	137.13
20.00	10000.00	.002	10	148.21
20.00	25000.00	.001	11	162.13
30.00	20.00	.600	3	35.32
30.00	50.00	.375	4	58.64
30.00	100.00	.231	5	79.00
30.00	500.00	.057	7	128.68
30.00	1000.00	.029	8	150.39
30.00	5000.00	.006	9	194.54
30.00	10000.00	.003	10	211.24
30.00	25000.00	.001	11	235.14
50.00	20.00	.714	3	43.85
50.00	50.00	.500	4	77.05
50.00	100.00	.333	4	108.08
50.00	500.00	.091	6	190.80
50.00	1000.00	.048	7	223.81
50.00	5000.00	.010	9	300.68
50.00	10000.00	.005	9	336.01
50.00	25000.00	.002	10	370.54
100.00	20.00	.833	2	50.91
100.00	50.00	.667	3	98.95
100.00	100.00	.500	4	154.10
100.00	500.00	.167	6	312.69
100.00	1000.00	.091	6	381.60
100.00	5000.00	.020	8	535.92
100.00	10000.00	.010	9	601.36
100.00	25000.00	.004	10	685.65

MEAN DEMAND VALUE PER P.L.T. EQUALS 3.8

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	6	7.82
2.00	50.00	.038	8	9.68
2.00	100.00	.020	8	10.90
2.00	500.00	.004	10	13.78
2.00	1000.00	.002	10	15.15
2.00	5000.00	.000	12	17.54
2.00	10000.00	.000	12	18.68
2.00	25000.00	.000	13	19.88
5.00	20.00	.200	5	14.50
5.00	50.00	.091	6	19.55
5.00	100.00	.048	7	22.79
5.00	500.00	.010	9	30.32
5.00	1000.00	.005	10	33.76
5.00	5000.00	.001	11	40.10
5.00	10000.00	.000	12	43.28
5.00	25000.00	.000	12	46.69
10.00	20.00	.333	4	22.16
10.00	50.00	.167	6	31.33
10.00	100.00	.091	6	39.11
10.00	500.00	.020	8	54.51
10.00	1000.00	.010	9	60.63
10.00	5000.00	.002	10	75.77
10.00	10000.00	.001	11	80.20
10.00	25000.00	.000	12	87.69
15.00	20.00	.429	4	26.52
15.00	50.00	.231	5	40.10
15.00	100.00	.130	6	50.89
15.00	500.00	.029	8	75.63
15.00	1000.00	.015	9	86.68
15.00	5000.00	.003	10	106.78
15.00	10000.00	.001	11	116.21
15.00	25000.00	.001	11	128.50
20.00	20.00	.500	4	30.89
20.00	50.00	.286	5	47.80
20.00	100.00	.167	6	62.66
20.00	500.00	.038	8	96.76
20.00	1000.00	.020	8	109.02
20.00	5000.00	.004	10	137.80
20.00	10000.00	.002	10	151.54
20.00	25000.00	.001	11	164.50
30.00	20.00	.600	3	35.93
30.00	50.00	.375	4	59.77
30.00	100.00	.231	5	80.20
30.00	500.00	.057	7	130.26
30.00	1000.00	.029	8	151.27
30.00	5000.00	.006	9	198.99
30.00	10000.00	.003	10	213.57
30.00	25000.00	.001	11	236.51
50.00	20.00	.714	3	43.91
50.00	50.00	.500	4	77.21
50.00	100.00	.333	4	110.82
50.00	500.00	.091	6	195.54
50.00	1000.00	.048	7	227.87
50.00	5000.00	.010	9	303.17
50.00	10000.00	.005	10	337.62
50.00	25000.00	.002	10	378.85
100.00	20.00	.833	2	51.57
100.00	50.00	.667	3	99.80
100.00	100.00	.500	4	154.43
100.00	500.00	.167	6	313.32
100.00	1000.00	.091	6	391.09
100.00	5000.00	.020	8	545.11
100.00	10000.00	.010	9	606.33
100.00	25000.00	.004	10	688.98

MEAN DEMAND VALUE PER P.L.T. EQUALS 3.9

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	7	7.83
2.00	50.00	.038	8	9.70
2.00	100.00	.020	8	11.14
2.00	500.00	.004	10	13.90
2.00	1000.00	.002	11	15.23
2.00	5000.00	.000	12	17.67
2.00	10000.00	.000	13	18.98
2.00	25000.00	.000	13	20.16
5.00	20.00	.200	5	14.85
5.00	50.00	.091	7	19.58
5.00	100.00	.048	7	23.29
5.00	500.00	.010	9	30.69
5.00	1000.00	.005	10	33.90
5.00	5000.00	.001	11	40.67
5.00	10000.00	.000	12	43.44
5.00	25000.00	.000	13	47.46
10.00	20.00	.333	5	22.22
10.00	50.00	.167	6	31.48
10.00	100.00	.091	7	39.16
10.00	500.00	.020	8	55.69
10.00	1000.00	.010	9	61.37
10.00	5000.00	.002	11	76.17
10.00	10000.00	.001	11	81.34
10.00	25000.00	.000	12	88.35
15.00	20.00	.429	4	26.90
15.00	50.00	.231	5	40.82
15.00	100.00	.130	6	51.59
15.00	500.00	.029	8	76.33
15.00	1000.00	.015	9	86.93
15.00	5000.00	.003	10	108.46
15.00	10000.00	.001	11	116.84
15.00	25000.00	.001	12	128.85
20.00	20.00	.500	4	31.03
20.00	50.00	.286	5	48.19
20.00	100.00	.167	6	62.97
20.00	500.00	.038	8	96.98
20.00	1000.00	.020	8	111.38
20.00	5000.00	.004	10	138.98
20.00	10000.00	.002	11	152.35
20.00	25000.00	.001	11	167.84
30.00	20.00	.600	3	36.63
30.00	50.00	.375	4	61.06
30.00	100.00	.231	5	81.64
30.00	500.00	.057	7	132.33
30.00	1000.00	.029	8	152.67
30.00	5000.00	.006	10	200.01
30.00	10000.00	.003	10	216.92
30.00	25000.00	.001	11	238.85
50.00	20.00	.714	3	44.08
50.00	50.00	.500	4	77.58
50.00	100.00	.333	5	111.12
50.00	500.00	.091	7	195.81
50.00	1000.00	.048	7	232.92
50.00	5000.00	.010	9	306.87
50.00	10000.00	.005	10	338.98
50.00	25000.00	.002	11	380.87
100.00	20.00	.833	2	52.33
100.00	50.00	.667	3	100.88
100.00	100.00	.500	4	155.16
100.00	500.00	.167	6	314.83
100.00	1000.00	.091	7	391.63
100.00	5000.00	.020	8	556.90
100.00	10000.00	.010	9	613.74
100.00	25000.00	.004	10	694.88

MEAN DEMAND VALUE PER P.L.T. EQUALS 4.0

HOLDING COST(C1)	OUTAGE COST(C2)	C1/(C1+C2)	STOCKAGE OBJECTIVE	VARIABLE COST
2.00	20.00	.091	7	7.86
2.00	50.00	.038	8	9.75
2.00	100.00	.020	9	11.25
2.00	500.00	.004	10	14.07
2.00	1000.00	.002	11	15.29
2.00	5000.00	.000	12	17.88
2.00	10000.00	.000	13	19.03
2.00	25000.00	.000	13	20.57
5.00	20.00	.200	6	14.89
5.00	50.00	.091	7	19.66
5.00	100.00	.048	8	23.53
5.00	500.00	.010	9	31.19
5.00	1000.00	.005	10	34.15
5.00	5000.00	.001	11	41.46
5.00	10000.00	.000	12	43.77
5.00	25000.00	.000	13	47.57
10.00	20.00	.333	5	22.31
10.00	50.00	.167	6	31.73
10.00	100.00	.091	7	39.32
10.00	500.00	.020	9	56.25
10.00	1000.00	.010	9	62.39
10.00	5000.00	.002	11	76.47
10.00	10000.00	.001	11	82.93
10.00	25000.00	.000	12	89.41
15.00	20.00	.429	4	27.35
15.00	50.00	.231	5	41.67
15.00	100.00	.130	6	52.47
15.00	500.00	.029	8	77.32
15.00	1000.00	.015	9	87.45
15.00	5000.00	.003	10	110.72
15.00	10000.00	.001	11	117.93
15.00	25000.00	.001	12	129.41
20.00	20.00	.500	4	31.26
20.00	50.00	.286	5	48.72
20.00	100.00	.167	6	63.45
20.00	500.00	.038	8	97.49
20.00	1000.00	.020	9	112.51
20.00	5000.00	.004	10	140.74
20.00	10000.00	.002	11	152.94
20.00	25000.00	.001	12	169.42
30.00	20.00	.600	3	37.40
30.00	50.00	.375	4	62.52
30.00	100.00	.231	5	83.34
30.00	500.00	.057	7	134.92
30.00	1000.00	.029	8	154.64
30.00	5000.00	.006	10	200.78
30.00	10000.00	.003	10	221.44
30.00	25000.00	.001	11	242.33
50.00	20.00	.714	3	44.36
50.00	50.00	.500	4	78.15
50.00	100.00	.333	5	111.55
50.00	500.00	.091	7	196.62
50.00	1000.00	.048	8	235.31
50.00	5000.00	.010	9	311.93
50.00	10000.00	.005	10	341.52
50.00	25000.00	.002	11	382.35
100.00	20.00	.833	2	53.19
100.00	50.00	.667	3	102.20
100.00	100.00	.500	4	156.29
100.00	500.00	.167	6	317.26
100.00	1000.00	.091	7	393.24
100.00	5000.00	.020	9	562.54
100.00	10000.00	.010	9	623.86
100.00	25000.00	.004	10	703.70

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Stockage objectives for slow moving repa
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